RAFFERTY-ALAMEDA PROJECT
ENVIRONMENTAL IMPACT STATEMENT

Summary Report

SOURIS BASIN DEVELOPMENT AUTHORITY

EXECUTIVE SUMMARY

Rafferty/Alameda
Environmental Impact Statement

August 4, 1987

INTRODUCTION

For decades, water control facilities on the Souris River in Saskatchewan have been considered. Construction was anticipated as early as the 1930's and in the late 1950's, Prairie Farm Rehabilitation Administration (PFRA) examined sites on the Moose Mountain Creek for a possible dam. Later, in the 1960's, PFRA, as part of the Nelson River Basin Study, conducted pre-feasibility analysis of possible dam sites along the Souris River including sites at Rafferty and at Alameda on the Moose Mountain Creek.

Still, despite this being one of the driest areas of Saskatchewan and ironically, its history of destructive flooding, plans for development on the Souris were beset with interruptions and lagged behind those on rivers in other areas of the Province.

Residents of southeastern Saskatchewan continued to press for water-management on the Souris River and in the 1970's the Souris River Basin Study brought the issue into focus. That study identified a strong local impetus for water storage on the Souris River and in particular, for the construction of a large dam at a site known as Rafferty, northwest of the City of Estevan. The Souris River Basin Study concluded, however, that the cost of constructing such a dam could not be justified at the time without a major industrial use to offset the required capital costs.

In the early and mid 1980's, events combined to make the construction of dams on the Souris River System a viable enterprise. The Government of Saskatchewan had placed a major emphasis on the development of water-based resources as a key component of strategic economic diversification in this Province. To this end, the Government confirmed this in legislation and provided fiscal authority to the newly formed agency, the Saskatchewan Water Corporation, for implementation.

During the same period, the Saskatchewan Power Corporation (SPC) identified investment in additional thermal generating capacity as the most cost effective means to achieve corporate requirements. After preliminary evaluations, the alternatives which SPC had considered feasible in order to meet projected demands were reduced to three: a new lignite-fired unit at Shand; a new lignite-fired unit at Poplar River; or purchasing electricity from Manitoba. Detailed analysis confirmed Shand as the best option. Shand will provide an opportunity for SPC to proceed with a new power plant which will meet Canadian Federal Emission guidelines for air quality and will use significantly less expensive technology than scrubbers; Shand will have more water supply options and will require potentially less water treatment than would Poplar River (potential water treatment problems could exist at Poplar River due to the existing groundwater quality); the coal prices for Shand, proved to be more economical than those available for Poplar River; the cost for constructing Shand was more economical than buying electricity from Manitoba and provided greater economic spinoffs for Saskatchewan.

Saskatchewan had thus established an agency with capacity to manage water resources in the Province, and identified a principal industrial user to further

rationalize public investment of the required magnitude. Concurrent with these developments, the United States indicated interest in a cost-shared Canadian venture to acquire 100 year flood protection for the City of Minot, North Dakota. Combined, these three factors provided an attractive scenario for development of a multiple objective water management facility on the Souris River System in Saskatchewan. The concept thus moved beyond one of seasonal water storage and protection of property along the river banks - its scope and its potential now extended into industrial and economic development benefits. In short, the initiative had come to represent a significant opportunity with achievable short and long term income and employment gains accruing from the initial public expenditure.

On February 12, 1986, Premier Grant Devine announced that, subject to compliance with all environmental and regulatory approvals, it was the intention of the Government of Saskatchewan to proceed with the construction of the Rafferty and Alameda Dams on the Souris River system in southeastern Saskatchewan. In recognition of the fact that the Project would be multiple-objective in nature and would require strong co-ordination of various private sector consultants and government departments and agencies, the Souris Basin Development Authority (the Authority) was created. A Crown Corporation, the Authority has as its mandate the responsibility for the planning and building of all facilities associated with the Project and is therefore the proponent.

Through this Environmental Impact Statement (EIS), the Authority is requesting a license from the Saskatchewan Department of Environment to construct the Rafferty Dam, the Alameda Dam, and related appurtenances on the Souris River in southeastern Saskatchewan (hereinafter referred to as the Project).

In the design and development of the Project, the Authority has sought and acted upon the professional advice and judgment of external agencies. For example, in choosing between alternate Rafferty dam sites the Authority acted upon the recommendation of the dam design consultants and the External Engineering Design Review Board in adjusting the initial selection to a site further downstream. This resulted in reduced wildlife habitat losses in the upper reaches of the Souris River and Roughbark Creek, reduction in the required land purchase and oil well mitigation, and a reduction in the height of dams, causeways and roads, with corresponding reduction in costs to the proponent. Similarly, the views of wildlife specialists have been sought by the proponent in designing mitigation options for the project. The influence of their judgment is particularly apparent in the Authority's proposals for the development of waterfowl and white-tailed deer habitat. Alternatives have been tested throughout the planning process.

The Authority contracted with numerous consultants, government agencies and interest groups in preparing this Environmental Impact Statement (EIS). In the context of this summary report, it has been necessary to condense much of their analyses and recommendations and, in some cases, to simplify them in order to facilitate and to encourage readership. For that reason, this document contains only information that is directly relevant to the consideration of impact assessment and/or assists the reader in gaining a basic understanding of the context in which the Project will occur. The reader is directed to the specific section of the EIS which deals in much greater detail with the Project. Comprising seventeen

chapters, the EIS is prefaced with this Executive Summary as a synopsis of the larger work.

Technical information has been presented in sequential fashion, the intent being to provide the reader with a cumulatively comprehensive context within which to assess the Project. The first chapters introduce the reader to a complete description of the Project and the prevailing historic, social and economic influences upon its development. These provide an essentially qualitative discussion, quantified where helpful to the overall analyses. Technical assessments of the physical elements relevant to the Project follow. Herein are described the physical features and tolerances of the Study Area - Geology and Mineral Resources, Hydrogeology, Hydrology, Water Quality, Soils and Natural Vegetation. Transportation, Land Use, Irrigation, Fisheries, Wildlife, Heritage Resources and Recreation are influenced by and are often the product of physical, natural and cultural characteristics of a given environment and hence are the most obviously sensitive to change. Potential impact of the Project and proposed mitigation are discussed at length in these chapters.

SUMMARY OF CIRCUMSTANCES

The Project is designed to facilitate management of the water resources of the Souris River Basin and to apply those resources to the industrial, economic and social advantage of residents within the basin area in Saskatchewan. The Souris River itself is characterized by a slow moving, meandering, undisciplined flow which originates in Saskatchewan near Cedoux. It flows southeasterly from its source in an irregular pattern to cross the International Boundary into the state of North Dakota where it continues to flow southeast and through the City of Minot. It then turns north, crossing the International Boundary again, this time into the Province of Manitoba. Travelling in a northeasterly direction, it winds its way to its confluence with the Assiniboine River. Total length is approximately 700 kilometres from source to mouth.

The Souris River Valley is essentially flat and shallow hence the slow rate of flow of the river within it. Above the City of Weyburn, the valley is quite poorly defined and although dredging has improved sections in this reach, the river banks are low and flooding occurs. Below Weyburn, banks are better defined and there the valley has greater slope. About halfway between Weyburn and Estevan the valley widens, there is very little slope and the river banks have risen above the adjacent flats. As a result, when the banks are topped, the entire valley floods. This is prevalent throughout the river's length within the Dead Lake to McDonald Lake area.

Below the confluence of Long Creek, the valley becomes steeper, the banks higher and the flood plain less extensive. Below Oxbow and Glen Ewen, the river flows south and the valley widens, becoming deeper until it passes into the U.S.

Most of the Souris River Basin has been cultivated and the sub-soil is generally of a gravelly nature with an overburden of glacial deposits. There are aspen bluffs, brush and scrub and native grasslands in uncultivated areas. The

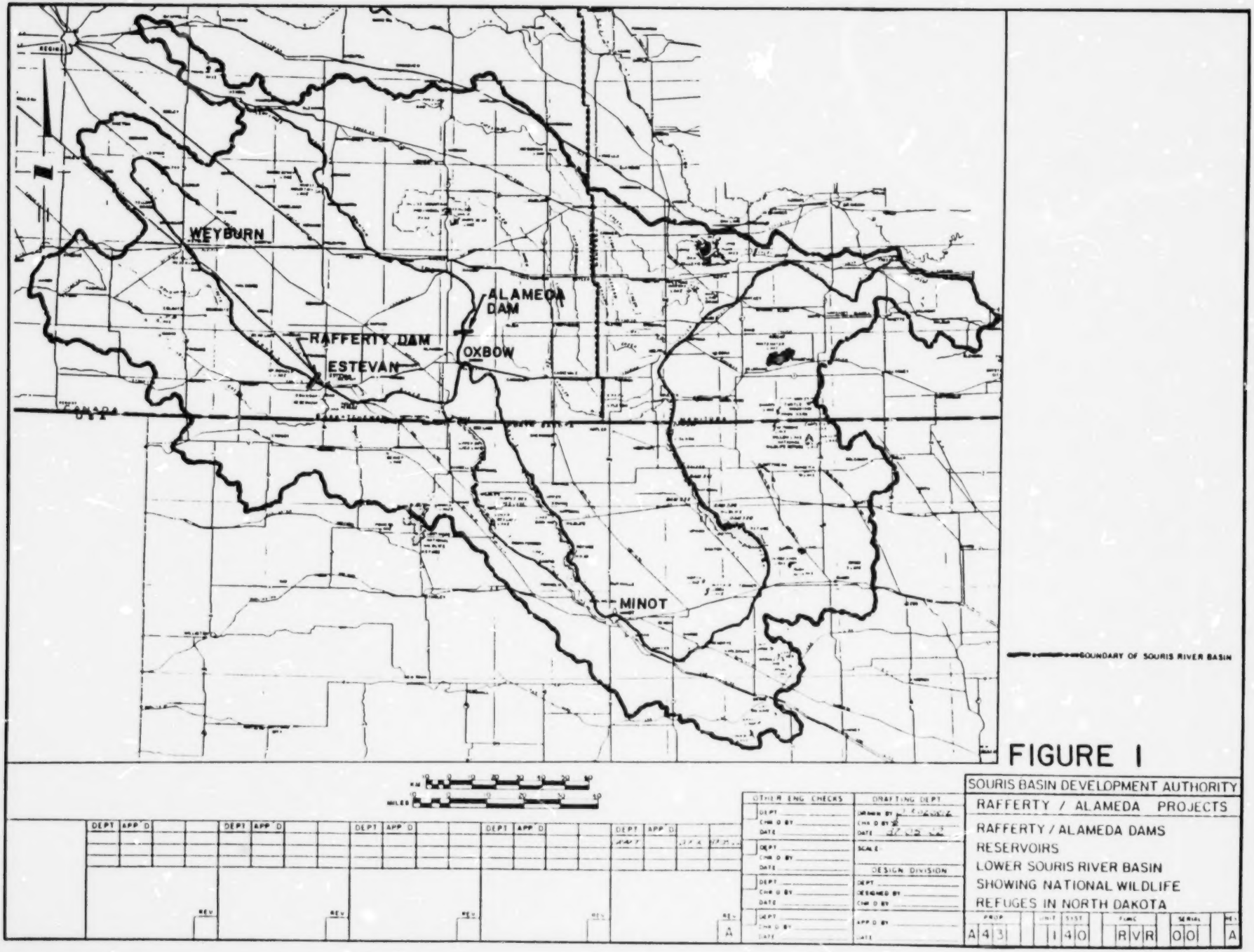


FIGURE 1

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY / ALAMEDA DAMS
RESERVOIRS
LOWER SOURIS RIVER BASIN
SHOWING NATIONAL WILDLIFE
REFUGES IN NORTH DAKOTA

A 4 3 | 1 4 0 | R V R | 0 0 | A

uplands adjacent to the Souris River Valley generally comprise a series of flat plains with slight undulation.

The climate is semi-arid with annual evaporation and transpiration usually exceeding precipitation. Periods of drought, torrential thunderstorms, intense heat and intense cold are typical. Most of the run-off occurs in March, April and May when high flows frequently cause flooding. When these flows diminish, it is not unusual for drought to occur as soil moisture levels fall.

Variability of flow on the Souris River has influenced development throughout the area. Flood events occur on average two out of every ten years yet the area is characteristically drought-prone. The Souris River Basin in Saskatchewan has, on average, only six farms per 1,000 that irrigate compared to a provincial average of 20 per 1,000. This is directly attributable to the fact that few water storage projects have been developed on the river and that currently only a small amount of water can be stored within this system.

The economy of southeastern Saskatchewan has suffered in recent years. The outlook has been harsh and there has been limited optimism in the forecasts for agriculture and oil. This area is heavily dependent on these primary resources and the resident labour force falls behind that of Saskatchewan in effective distribution among other industries. The area is losing people and therefore vitality. It is clear that increasing numbers of younger components of the labour force have been taking the road out over the past fifteen years and that if nothing is done, more are likely to do so. The 'stay option' in many cases is simply not available to many young people in the area.

This portion of the province requires real investment in opportunity development. The Rafferty/Alameda Project represents a major stimulative investment at a critical time in the local economy. Further, it serves to reassure ventures into new opportunities in recreation and agricultural diversification as well as to encourage new investment in related services.

At the heart of project activity, the City of Estevan has a good commercial profile of community vitality and opportunity readiness. The Project will reaffirm Estevan as a growth center at a time when confidence in other industrial sectors is low. In the short term, it would provide some protection for the local labour force and service sector, and in the longer term it will provide an effective stimulus for new initiatives.

The Authority will require contractors to observe a local hire priority and as construction work is essentially seasonal, it is likely that the majority of the Project's manpower requirements will be satisfied from within the resident labour force. As many of these workers already make their homes in the area, an increased but manageable demand for housing is anticipated in the Estevan area.

Business activity within goods and services outlets is anticipated to increase and initially this may be somewhat disruptive to local residents' patterns. Local purchase commitments on the part of the Authority, however, are expected to mitigate this disruption to some degree as there is likely to be a corresponding increase

PHOTO ONE: Flooded Souris River Valley upstream of CPR Trestle/Rafferty Dam Site, 1985 (Main River Channel can be seen meandering through bottom of flooded valley).

(Photo courtesy: Crippen Acres Ltd.)

PHOTO TWO: Souris River Flood Waters near bridge just south of Estevan at Highway 47, 1976.
(Photo courtesy: Souris Basin Development Authority)

PHOTO THREE: Normal Water levels on Souris River at same location.
(Photo courtesy: Souris Basin Development Authority)

PHOTO FOUR: 4 km upstream of Souris River Valley May 1987. Rafferty Dam Site, looking West.
(Photo courtesy: Souris Basin Development Authority)

PHOTO FIVE: Souris River Valley, April, 1976. Same site as above but flooded with 3 m of water; Farm Access Road and all Valley Land is completely inundated.
(Photo courtesy: Jack Muirhead)

PHOTO SIX: Sand Bagging Souris River, 1976. Roche Percee.
(Photo courtesy: Souris Basin Development Authority)

PHOTO SEVEN: Flood damage at Estevan, 1976.
(Photo courtesy: Souris Basin Development Authority)

in inventories, and types of service with a resulting net advantage to local consumers.

In anticipation of any currently unforeseen disadvantage to the social or economic fabric of the area, the Authority will endeavor to ensure that the Public Involvement component continues to be active and to provide a vehicle for resolution of public/private sector concerns. The Estevan office will remain open and staffed during construction and afterwards to respond as required to issues as they arise.

PROJECT DESCRIPTION

The Government of Saskatchewan, through the project proponent, the Souris Basin Development Authority, proposes to construct the Rafferty Dam on the mainstem of the Souris River six km northwest of Estevan; a channel connecting Boundary Reservoir with Rafferty Reservoir; downstream channelization from the Rafferty Dam site to a location on the Souris River near the Shand Power Station; and the Alameda Dam on the Moose Mountain Creek north of Oxbow.

I. Rafferty Dam and Reservoir

The Rafferty Dam will be built on the mainstem of the Souris River at a location approximately 6 km northwest of Estevan. The reservoir created will serve a number of purposes: it will greatly enhance recreation opportunities for southeastern Saskatchewan through the development of park facilities, cottage sites and additional water-based recreation; provide water for cooling two units at the Shand Power Station; provide enhanced wildlife development potential for certain species; provide water for the irrigation of 2,023 ha (5,000 acres) in the valley downstream of the dam; and provide considerable flood protection for the downstream communities of Estevan, Roche Percee and Oxbow in Saskatchewan as well as for North Dakota and, in particular, the City of Minot.

The Rafferty Reservoir will have a Full Supply Level (FSL) of 550.5 m and a Maximum Flood Level (MFL) of 554 m. To accommodate depletion of oil reserves in the upper reaches, the reservoir will be operated with an Initial Operating Level of 549.5 m. After these resources have been extracted (currently estimated at 20-25 years), the reservoir will be permitted to reach 550.5 m.

At Initial Operating Level (549.5 m), Rafferty Reservoir will have a surface area of 4,600 ha, a length of 56 km, and a volume of 394,000 dam^3. At Full Supply Level (550.5 m), it will have a surface area of 4,900 ha, a length of 57 km, a maximum width of 1.2 km, a maximum depth of 15.1 m (49.5 feet) and a volume of 443,000 dam^3. At Maximum Flood Level, (554.0 m), a surface area of 6,200 ha, a length of 60 km and a volume of 630,000 dam^3 will be attained temporarily. Once completed, Rafferty Reservoir will be the third largest impoundment of water in Saskatchewan after Lake Diefenbaker and Tobin Lake.

The facilities at Rafferty will consist of a zoned earth fill dam, a concrete service spillway, a low level outlet, an emergency spillway, and a reservoir. Construction of the dam is scheduled to commence 1988 April and to be completed

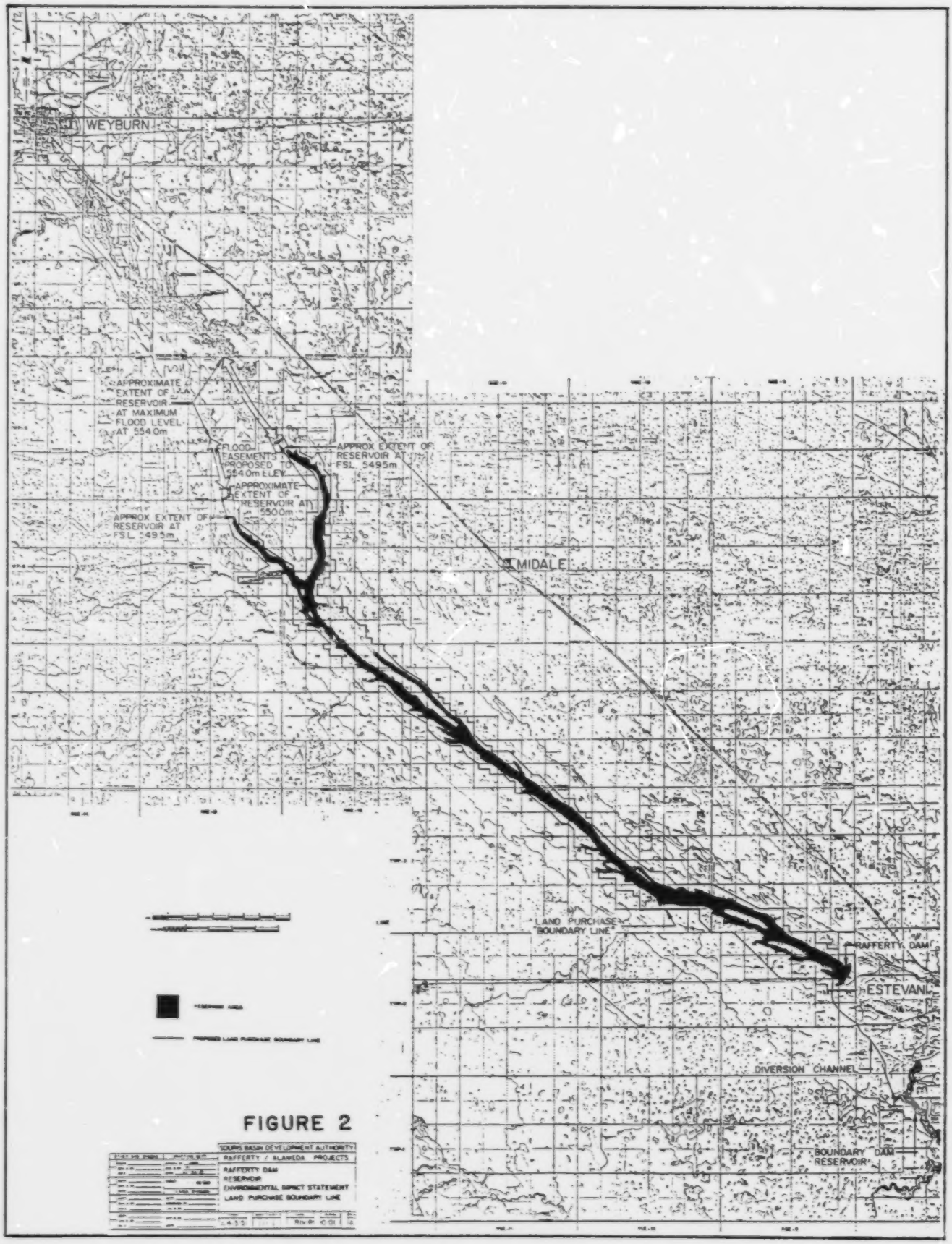
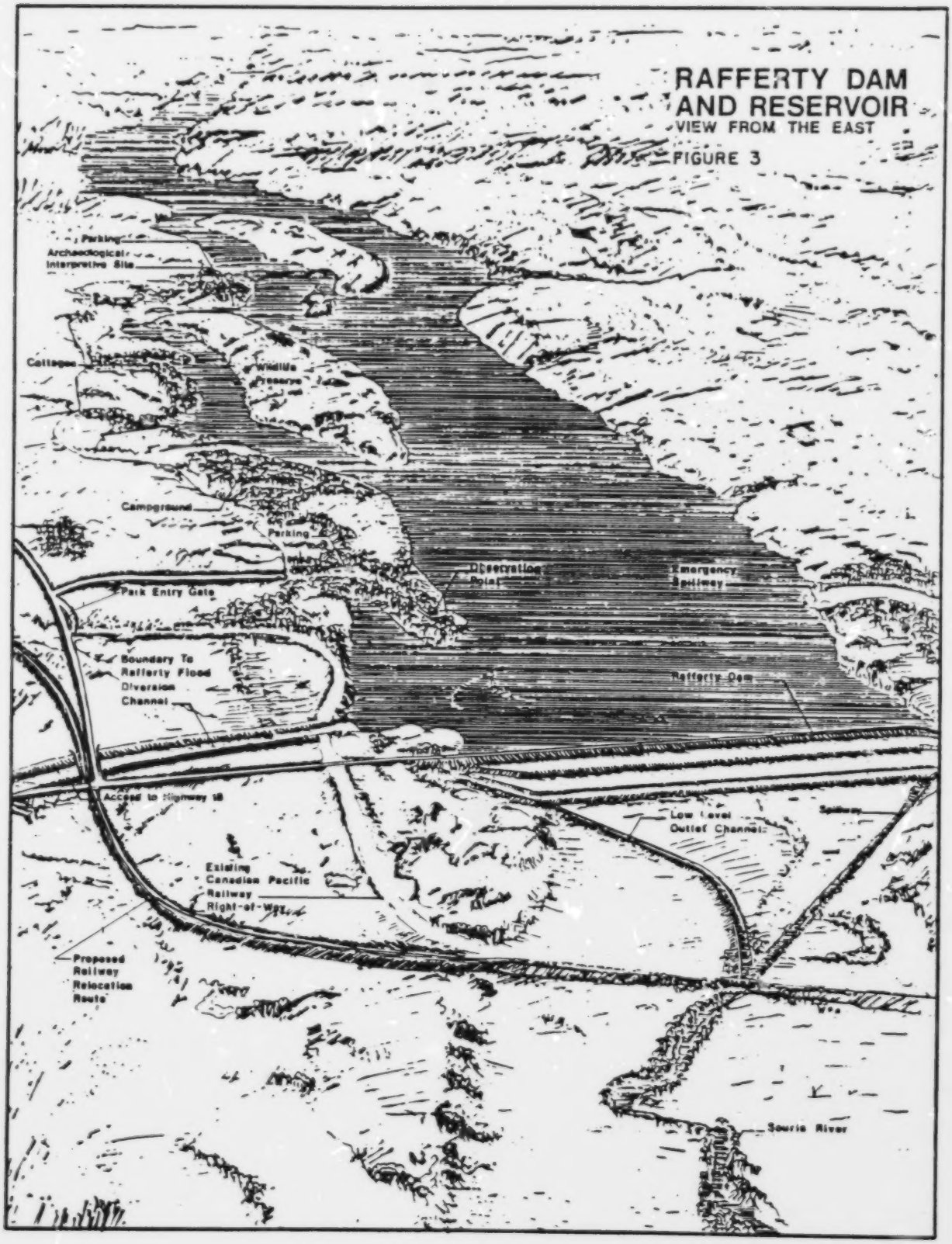

WEYBURN
APPROXIMATE EXTENT OF RESERVOIR AT MAXIMUM FLOOD LEVEL AT 554.0m
FLOOD EASEMENTS PROPOSED TO 554.0m ELEV.
APPROX EXTENT OF RESERVOIR AT FSL 549.5m
APPROXIMATE EXTENT OF RESERVOIR AT 550.0m
APPROX EXTENT OF RESERVOIR AT FSL 549.5m
MIDALE
LAND PURCHASE BOUNDARY LINE
RAFFERTY DAM
ESTEVAN
DIVERSION CHANNEL
BOUNDARY DAM RESERVOIR
SOURIS BASIN DEVELOPMENT AUTHORITY
RAFFERTY / ALAMEDA PROJECTS
RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
LAND PURCHASE BOUNDARY LINE

FIGURE 2


RAFFERTY DAM
AND RESERVOIR
VIEW FROM THE EAST
FIGURE 3
Parking
Archaeological Interpretive Site
Cottages
Wildlife Preserve
Campground
Parking
Park Entry Gate
Boundary To Rafferty Flood Diversion Channel
Access to Highway 18
Existing Canadian Pacific Railway Right-of-Way
Proposed Railway Relocation Route
Dissecting Point
Emergency Spillway
Rafferty Dam
Low Level Outlet Channel
Souris River

late in 1989. Work will be of a seasonal nature with virtually all activities scheduled for the summer months.

The Rafferty Dam portion of the Project is expected to create approximately 125 person years of employment during the construction phase. Wherever possible, contracts will be awarded by the S.B.D.A. through the competitive bidding process to qualified contractors who will be responsible for hiring their own work force. Project contractors will be required to comply with corporate policies on: preference for Saskatchewan products and services; use of local labour; and use of Saskatchewan suppliers and sub-contractors.

II. Downstream Channelization

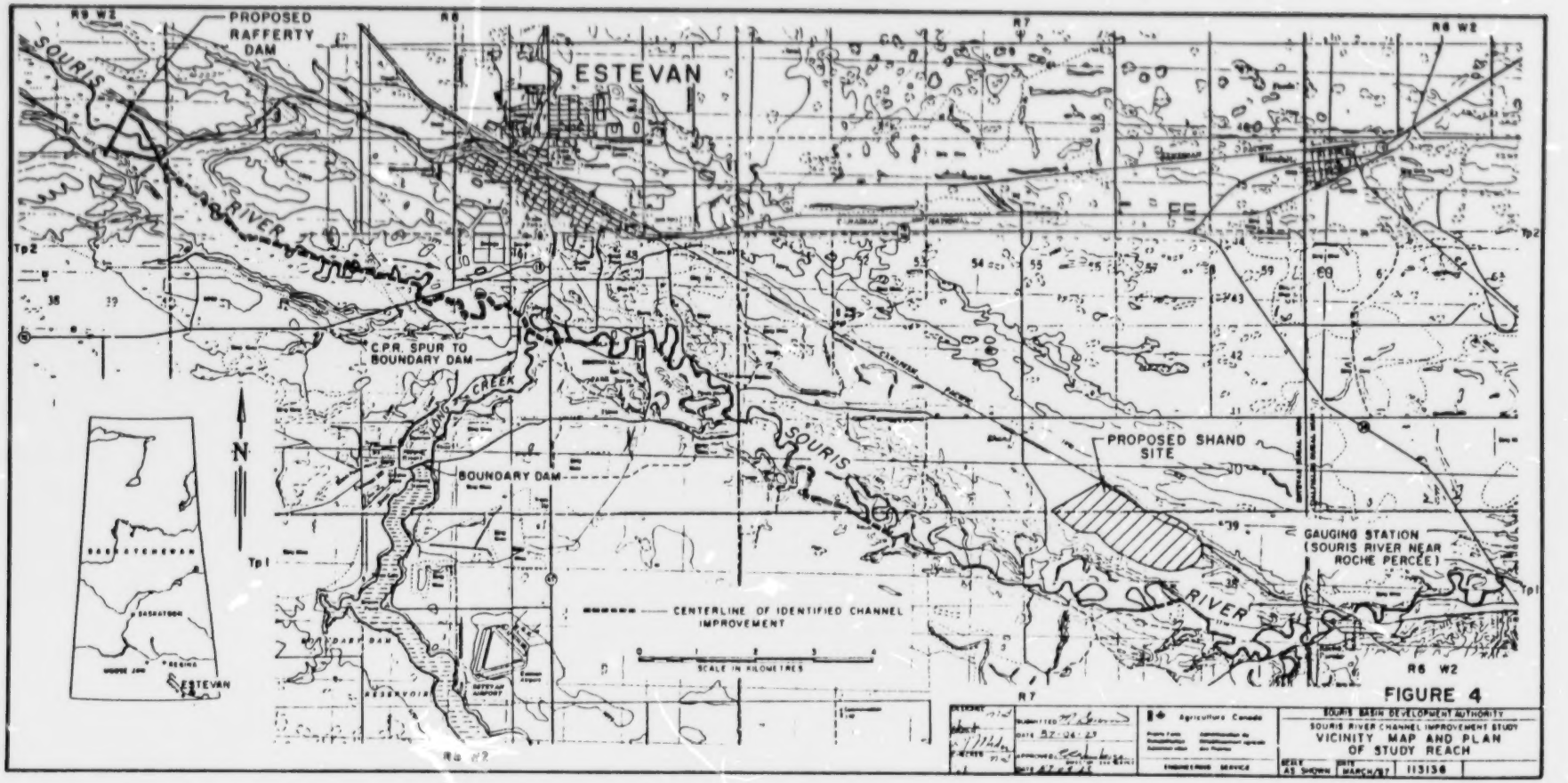
Some channelization downstream of the Rafferty Dam will be required in order to accommodate expected flow releases for such downstream uses as irrigation, recreation and for flood control. Water for the Shand Power Station will be transported via pipeline from Rafferty. The pipeline will also be used to convey sewage effluent from the City of Estevan sewage lagoons for use as a coolant at Shand. At present, this area of the Souris Valley is extremely prone to flooding both from the flows downstream on the mainstem of the Souris and flows from Long Creek.

Feasibility analysis has been conducted to identify the general route and the approximate locations of channelization. Detailed design work is pending. Channel improvements in the upstream section will consist of continuous channel excavation upstream of Highway 18 and bottom dredging downstream of Highway 18 to a location on the Souris River in the general vicinity of the Shand Power Station. No channel improvements are anticipated in the Souris River downstream from Shand.

Insofar as the work downstream of Highway 18 is concerned, it is not possible to avoid agricultural areas with the location of the channel improvements; developed areas such as building sites will be avoided. The identified alignment of the cutoffs should be considered as preliminary and may not be the most suitable in terms of land ownership and access considerations. The final alignment will be based upon a detailed balancing of land use, ownership and access considerations. Final cost estimation will depend upon detailed design and precise location of the channelization work.

In addition to these improvements it will be necessary to lower the CPR weir crest, relocate a portion of Highway 47 and to dredge the bottom upstream of Highway 47.

Detailed design work will be completed by June, 1988. Construction of the improved channel is scheduled to commence spring of 1989 and to be completed later in the same year. Work will be of a seasonal nature with virtually all activities scheduled for the summer months.


R9 W2
PROPOSED RAFFERTY DAM
R8
ESTEVAN
R7
R6 W2
SOURIS RIVER
Tp2
C.P.R. SPUR TO BOUNDARY DAM
BOUNDARY CREEK
BOUNDARY DAM
SOURIS RIVER
PROPOSED SHAND SITE
GAUGING STATION (SOURIS RIVER NEAR ROCHE PERCEE)
Tp1
N
SASKATCHEWAN
REGINA
ESTEVAN
CENTERLINE OF IDENTIFIED CHANNEL IMPROVEMENT
SCALE IN KILOMETRES
R8 W2
R7
FIGURE 4
SOURIS BASIN DEVELOPMENT AUTHORITY
SOURIS RIVER CHANNEL IMPROVEMENT STUDY
VICINITY MAP AND PLAN OF STUDY REACH
AS SHOWN
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III. The Boundary-Rafferty Diversion Channel

The Authority is proposing to construct a diversion channel connecting the existing Boundary Reservoir with Rafferty Reservoir. The channel has numerous benefits. It will provide the opportunity to reduce flood peaks at Estevan, Roche Percee and Oxbow which currently occur as a result of uncontrolled flows from Long Creek; result in a faster filling of the Rafferty Reservoir with available surplus flows from Long Creek; provide the opportunity to store water from the Long Creek drainage area which otherwise would be spilled and lost to further Saskatchewan use; allow the Rafferty Reservoir to be operated at a lower level until oil reserves in its upper reaches are depleted; and give the Saskatchewan Power Corporation a greater certainty of water supply for Boundary Dam Power Station. Material excavated for the channel will provide fill for a section of the road which will connect Highway 18 to Highway 39 across the dam. Also, the channel will provide additional water to Boundary Dam through the drainage of the mine spoil area as well as from Rafferty Reservoir.

The diversion channel will consist of an earth channel, a concrete inlet and outlet and a gated concrete control structure.

The Diversion Channel is expected to create approximately 36 person years of employment during the construction phase.

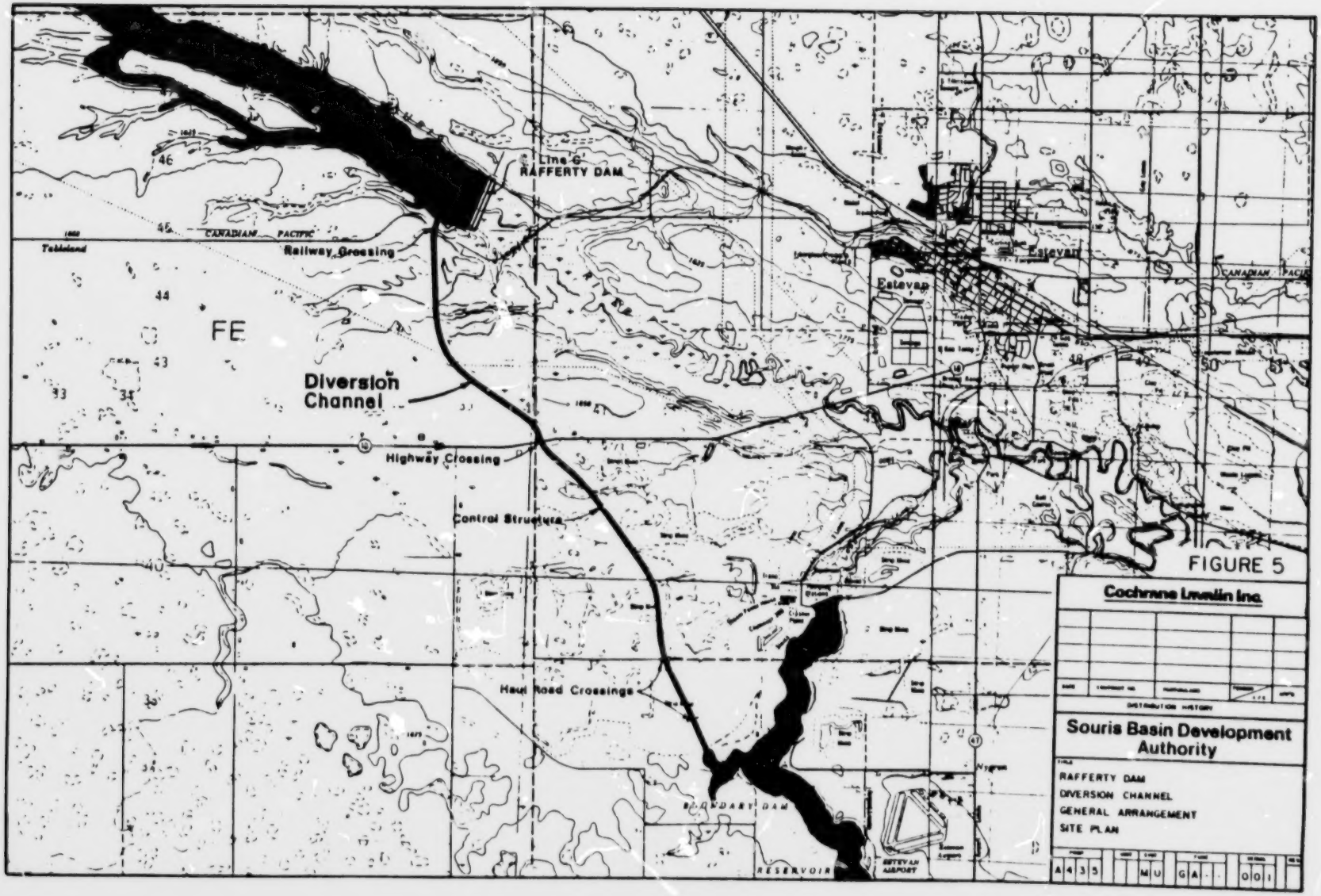
IV. Alameda Dam and Reservoir

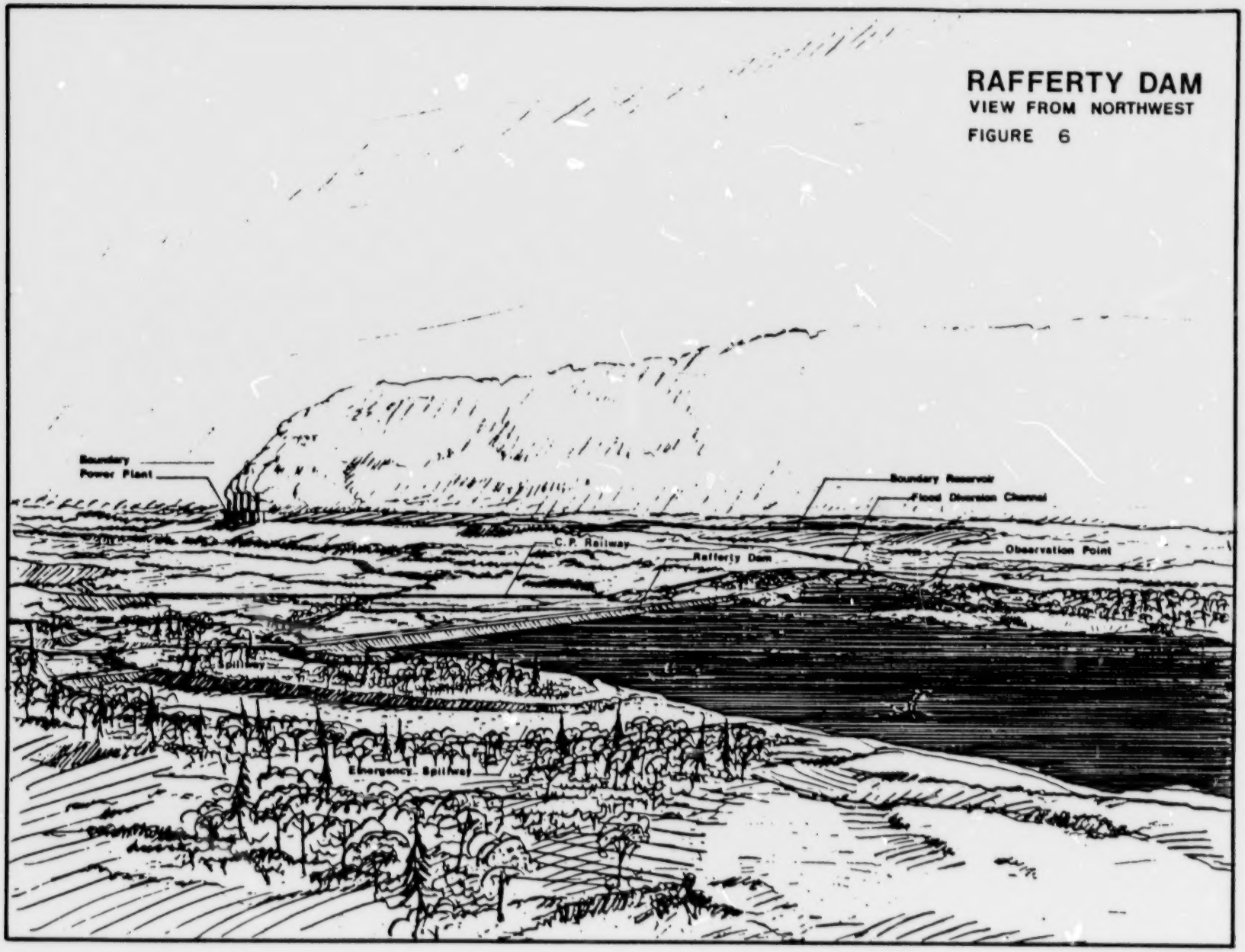
The Alameda Dam will be constructed on the Moose Mountain Creek approximately 14 km north of the Town of Oxbow. The Alameda Reservoir will, as with its counterpart at Rafferty, serve a number of purposes. It will provide recreation benefits for southeastern Saskatchewan and in particular it will alleviate pressure that has been experienced in recent years at Moose Mountain Provincial Park from heavy visitation. A public park will be developed at the Alameda Reservoir and opportunities for cottage lot development will result. As well, the Alameda Reservoir will serve to satisfy the majority of the Saskatchewan apportionment obligations to the United States.

The Alameda Reservoir will also be used as a supply of irrigation water. Current plans are for a maximum of 1,619 ha of upland soils to be irrigated from the Alameda Reservoir and an additional 1,214 ha of valley lowlands to be irrigated. It will operate with a Full Supply Level (FSL) of 574 m and a Maximum Flood Level (MFL) of 579 m. At FSL the Alameda Reservoir will have a surface area of 1,340 ha. and a volume of 95,000 dam^3. At MFL, the reservoir will have a surface area of 2,150 ha and a volume of 130,000 dam^3. It will have a gross catchment area of 5,203 sq. km.

The project consists of a zoned earth fill dam, a concrete service spillway, a low level outlet and a reservoir.

Construction of the Alameda Project is expected to commence spring of 1989 and to be completed by fall of 1990. Because it is not feasible to place and


Line 'G'
RAFFERTY DAM
CANADIAN PACIFIC
Railway Crossing
Estevan
Estevan
FE
Diversion Channel
Highway Crossing
Control Structure
Haul Road Crossings
BOUNDARY DAM
RESERVOIR
ESTEVAN AIRPORT
FIGURE 5
Cochrane Llewlin Inc.
Souris Basin Development Authority
RAFFERTY DAM
DIVERSION CHANNEL
GENERAL ARRANGEMENT
SITE PLAN
A435
MU
GA
001


RAFFERTY DAM
VIEW FROM NORTHWEST
FIGURE 6
Boundary
Power Plant
Boundary Reservoir
Flood Diversion Channel
C.P. Railway
Rafferty Dam
Observation Point
Spillway
Emergency Spillway

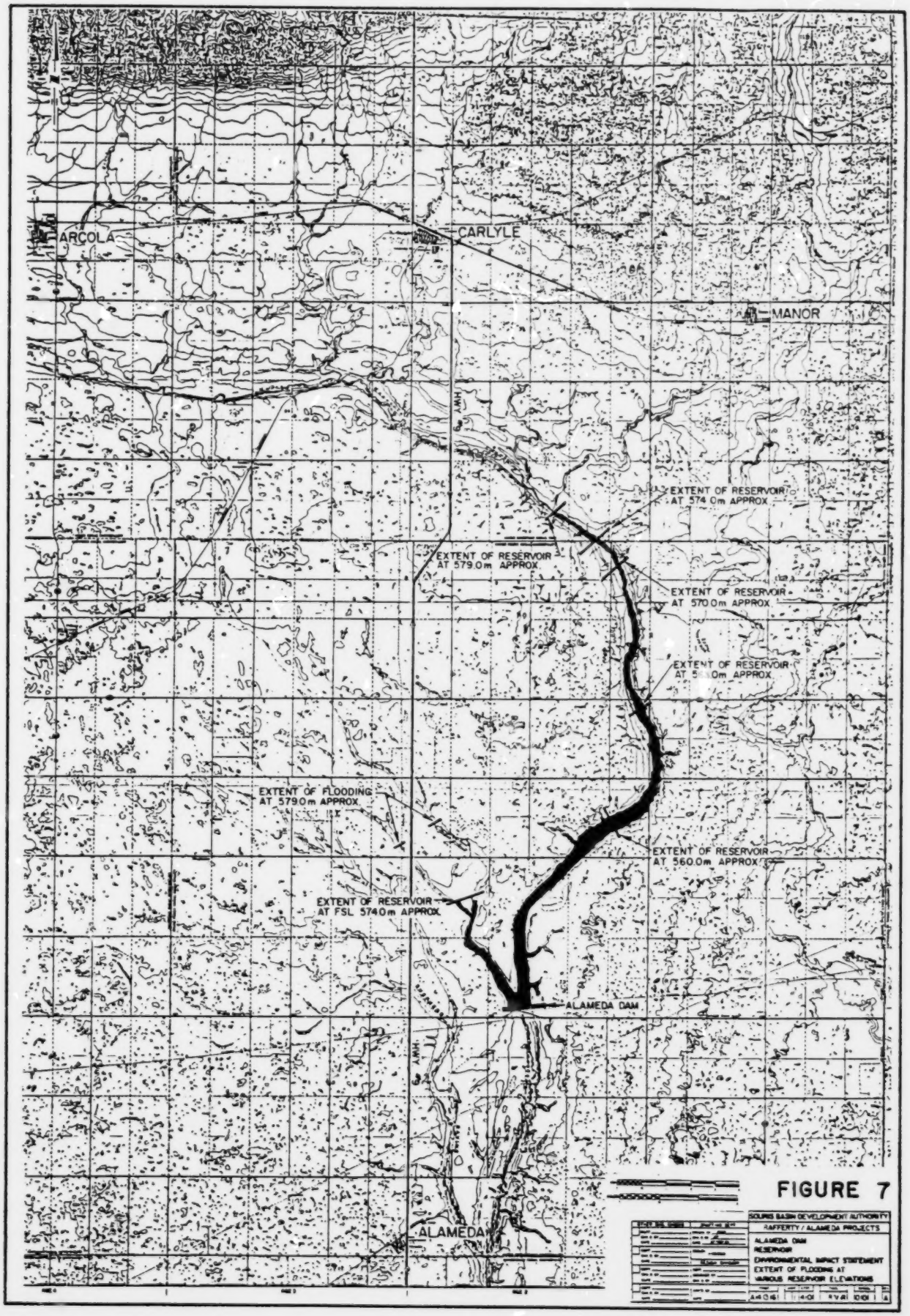
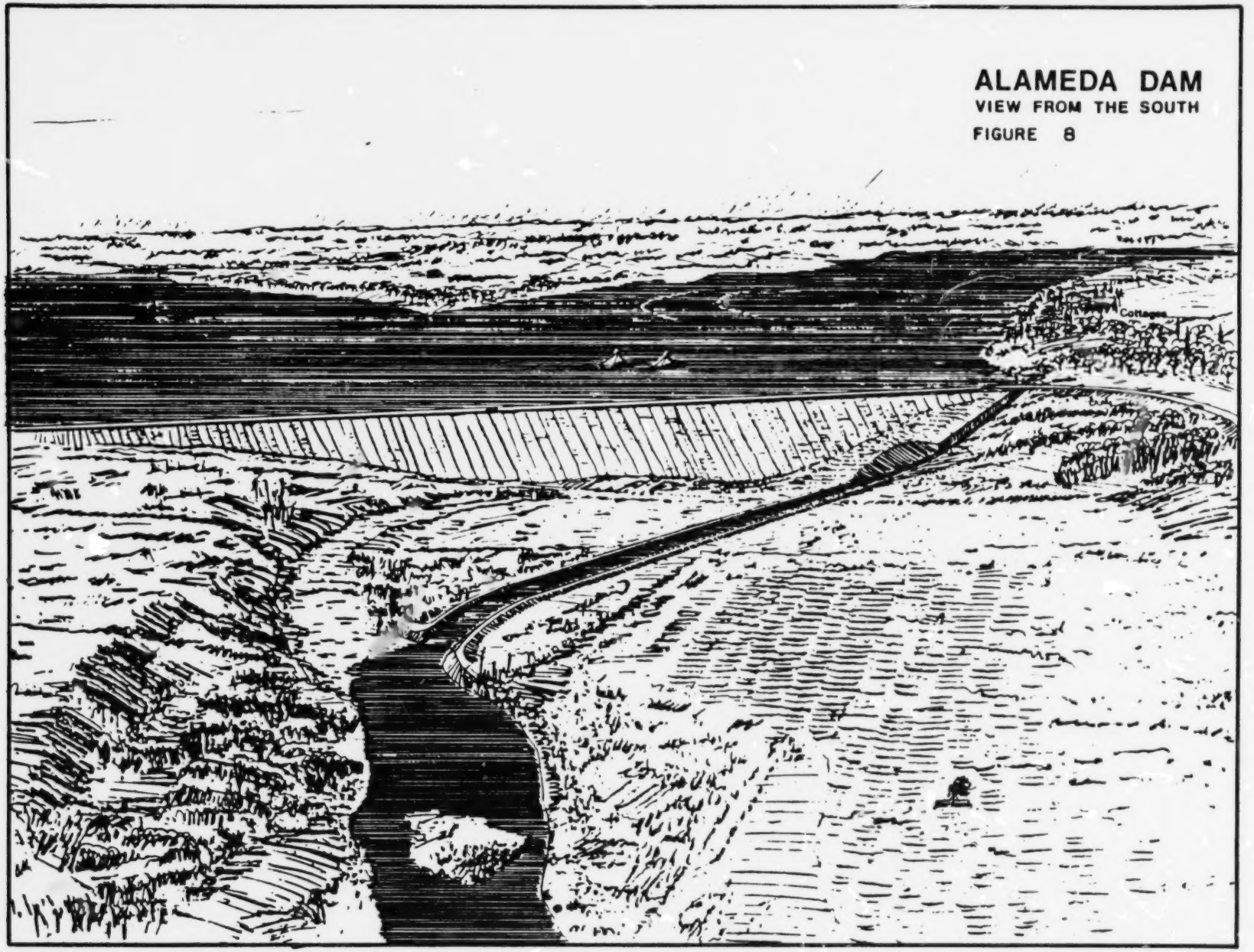

ARCOLA
CARLYLE
MANOR
EXTENT OF RESERVOIR AT 574.0m APPROX
EXTENT OF RESERVOIR AT 579.0m APPROX
EXTENT OF RESERVOIR AT 570.0m APPROX
EXTENT OF RESERVOIR AT 5 0m APPROX
EXTENT OF FLOODING AT 579.0m APPROX
EXTENT OF RESERVOIR AT 560.0m APPROX
EXTENT OF RESERVOIR AT FSL 574.0m APPROX
ALAMEDA DAM
ALAMEDA
SOURIS BASIN DEVELOPMENT AUTHORITY
RAFFERTY / ALAMEDA PROJECTS
ALAMEDA DAM RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
EXTENT OF FLOODING AT VARIOUS RESERVOIR ELEVATIONS

FIGURE 7


ALAMEDA DAM
VIEW FROM THE SOUTH
FIGURE 8

compact fill materials over the winter months, virtually all work will be done over the summer periods.

The Alameda portion of this Project is expected to create approximately 100 person years of employment during the construction phase.

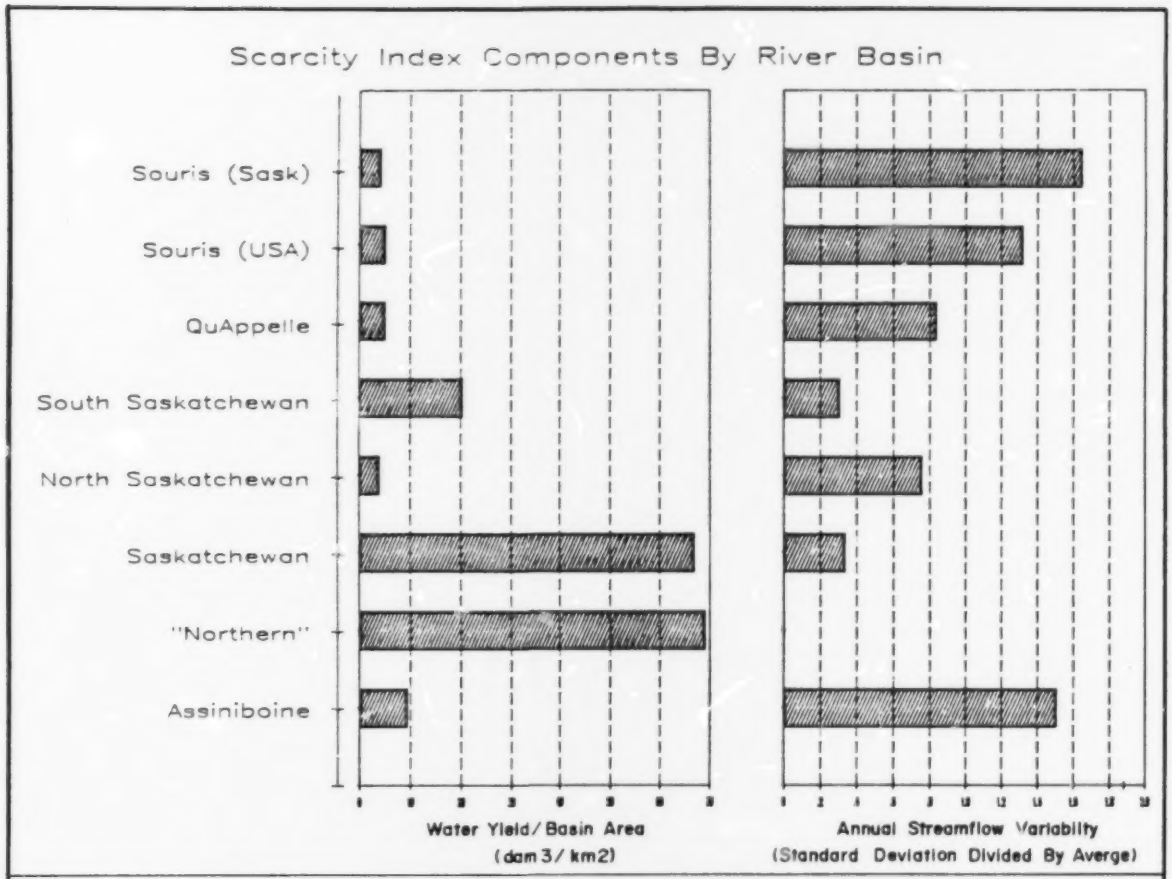
BENEFITS AND COSTS OF THE PROJECT

Water is a scarce resource in the Saskatchewan portion of the Souris River Basin. Consequently, effective management of this resource is a high priority. Surface water area per total basin area is the most dramatic comparison of water scarcity. The Souris River Basin has a ratio of .002, compared to a high ratio of .064 for the Saskatchewan River Basin. In other words, water in the Saskatchewan River Basin is 32 times more plentiful. Insofar as the Souris River is concerned the United States appears to be more water management conscious than Saskatchewan as is illustrated by a scarcity ratio of .005 in the Souris River Basin in North Dakota which is 2.5 times more water surface area than in the Saskatchewan portion of the basin.

The direct beneficiaries of the proposed Rafferty Alameda projects are agriculture with a potential of 4,855 hectares of irrigation development in designated suitable lands; recreation with a potential increase of 332,000 visitor days for the Rafferty and Alameda areas; industry, through the provision of water to the Shand Power Station; and society, in the form of increased flood control for farmlands and communities below the reservoirs.

Costs include the loss of 4,088 hectares of natural grazing land comprised of shrubs and mixed grasses, 1,265 hectares of hay lands, and 594 hectares of cultivated land; (13% of the inundated areas is of no agricultural value); disruption in lifestyle and household income for those within the reservoir areas; loss of some critical wildlife habitat; loss of a long established church camp; and the loss of a valued regional park site which stands as a testament to community spirit and service. In large part, these costs can be mitigated. The Authority is committed to fair and equitable compensation and the program designed for wildlife mitigation in the area is unequaled in its scope in Saskatchewan. Similarly, the Authority will ensure that Dr. Mainprize Regional Park will be reconstructed at a new site on the Rafferty Reservoir and that funds are made available for expanded, contemporary facilities. In recognition of Dr. Mainprize's contribution to the area and the respect in which his memory is held, the Authority proposes to recommend to the Government that the reservoir be named Mainprize Lake.

Quantified benefits and costs for the Project indicate a direct benefit/cost ratio of slightly less than unity. Gains accruing from indirect benefits beyond the Project, principally the opportunity to address relative water scarcity in the basin, are substantive and positive. Non-quantifiable benefits such as enhancement of local aesthetics, community pride and community vitality make the Project timely as well as appropriate. Relative to other contemporary major projects of this nature, the scenario for this initiative is highly favourable. Coupled with an increasingly critical need for stimulative investment in southeastern Saskatchewan, fiscal arguments favouring the Project become increasingly sound.


Scarcity Index Components By River Basin
Souris (Sask)
Souris (USA)
QuAppelle
South Saskatchewan
North Saskatchewan
Saskatchewan
"Northern"
Assiniboine
Water Yield/Basin Area
(dam3/km2)
Annual Streamflow Variability
(Standard Deviation Divided By Averge)

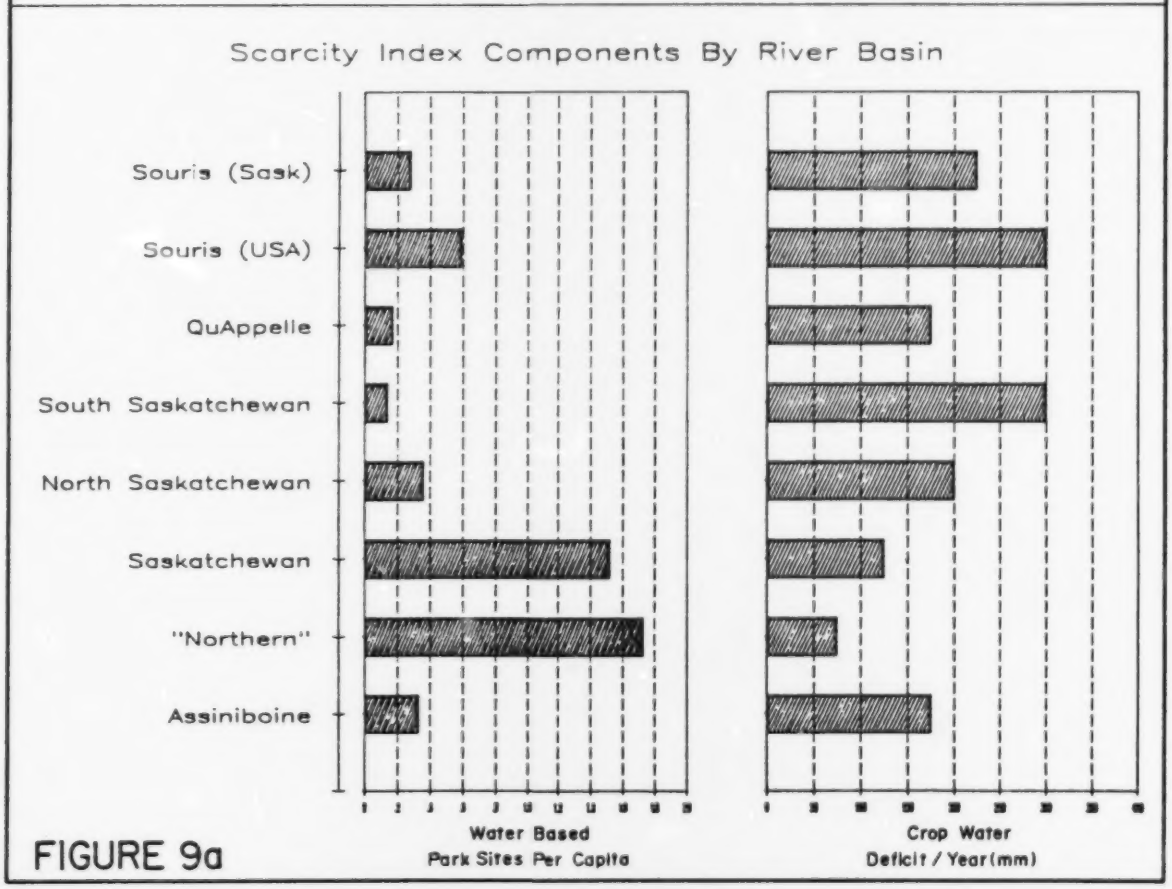
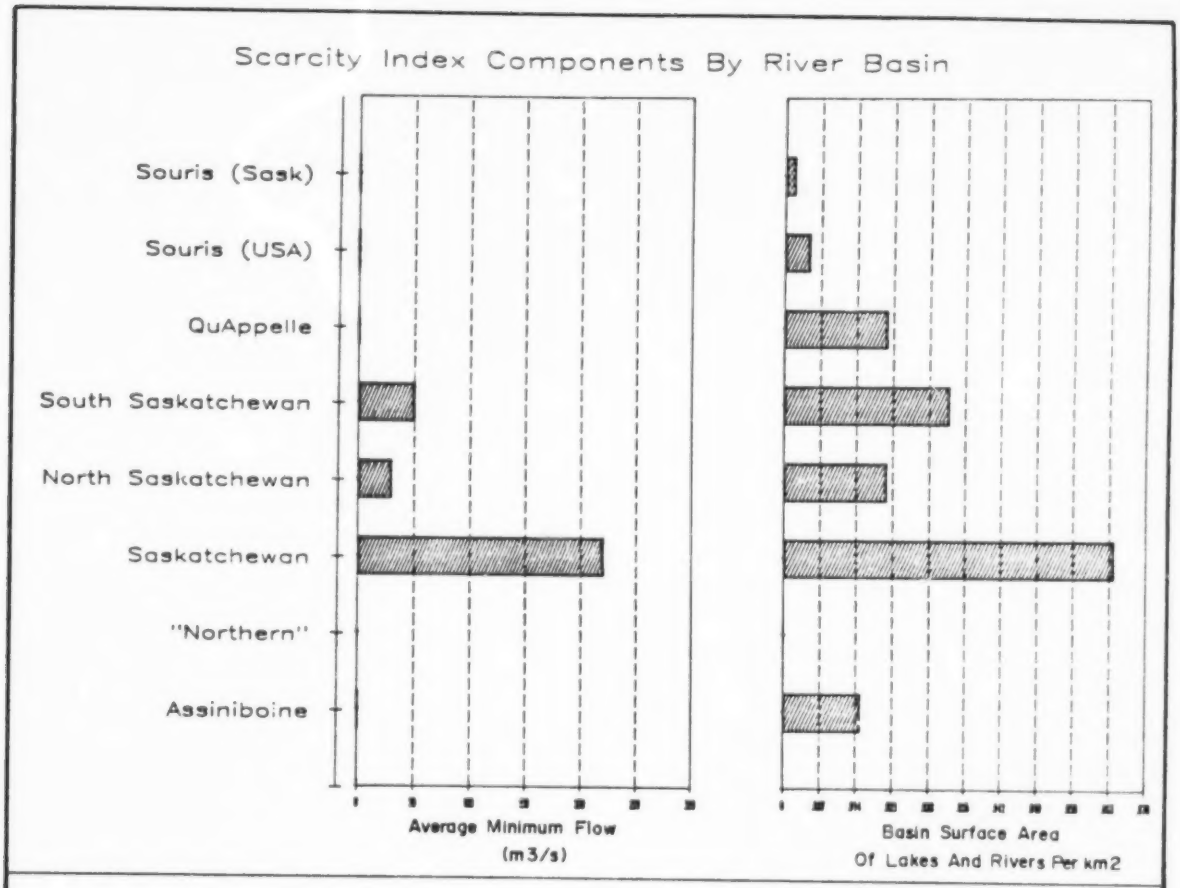

Scarcity Index Components By River Basin
Souris (Sask)
Souris (USA)
QuAppelle
South Saskatchewan
North Saskatchewan
Saskatchewan
"Northern"
Assiniboine
Water Based
Park Sites Per Capita
Crop Water
Deficit / Year(mm)

FIGURE 9a


Scarcity Index Components By River Basin
Souris (Sask)
Souris (USA)
QuAppelle
South Saskatchewan
North Saskatchewan
Saskatchewan
"Northern"
Assiniboine
Average Minimum Flow
(m3/s)
Basin Surface Area
Of Lakes And Rivers Per km2

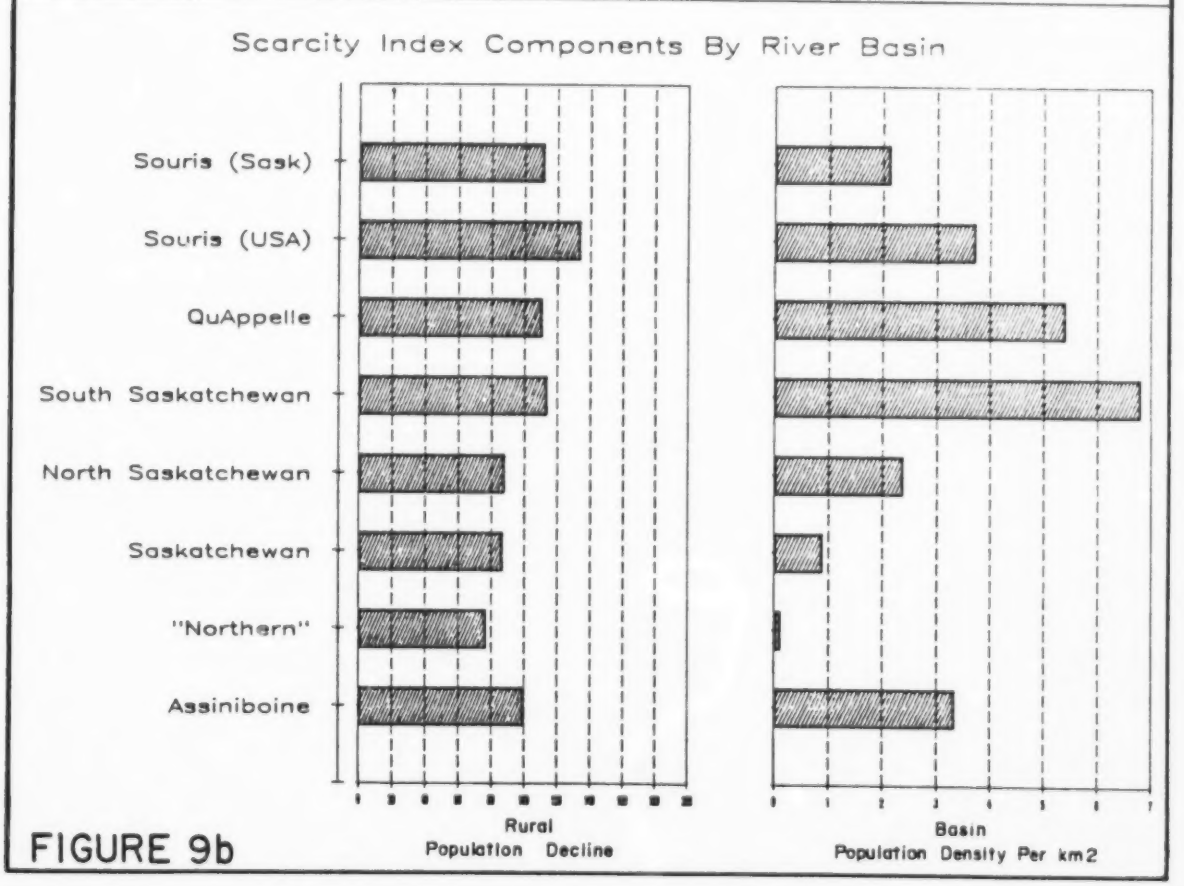

Scarcity Index Components By River Basin
Souris (Sask)
Souris (USA)
QuAppelle
South Saskatchewan
North Saskatchewan
Saskatchewan
"Northern"
Assiniboine
Rural
Population Decline
Basin
Population Density Per km2

FIGURE 9b

This potential for total societal gains has been used for justification of previous projects and applies in this case as well. Thirty years ago, when speaking about the possibility of constructing the Gardiner Dam on the South Saskatchewan River, a former Premier of the Province of Saskatchewan, T.C. Douglas, noted:

> *"This project will mean a great deal to Saskatchewan in terms of crop diversification through irrigation, the generation of hydroelectric power, the provision of adequate water supplies....flood control and recreational benefits."*
>
> *"The....Project is multi-purpose. Neither the electricity, nor the irrigation, nor the water supply made available would be sufficiently valuable alone to warrant the cost of construction. But together they make it worthwhile."*
>
> (Regina Leader Post, 1957)

TABLE OF PROJECT COSTS (1985$)

RAFFERTY	
Dam & Related Structures	$22,800,000
Land	6,670,000
ALAMEDA	
Dam & Related Structures	27,000,000
Land	4,200,000
ENGINEERING & ADMINISTRATION	5,100,000
MITIGATION	
Transportation	11,549,000
Fisheries	619,000
Wildlife	3,609,000
Archaeology	1,238,000
Recreation	3,705,000
Mainprize Park	1,638,000
Power Lines	857,000
Water Supplies	405,000
Reservoir Clearing	380,000
OIL WELLS & PUMPSTATIONS	
Rafferty	17,300,000
Alameda	3,860,000
DIVERSION CHANNEL	9,070,000
TOTALS	$120,000,000

PUBLIC INVOLVEMENT

The initiative represented by this water management proposal is rare in that extensive public input accompanies the design. Decisions made affecting the Souris River Basin, from the signing of the Boundary Waters Treaty in 1909 through to the planned construction of the Rafferty and Alameda Dams, are characterized by a singular sensitivity to the goals, objectives and well-being of basin residents. It is unique in Saskatchewan to have had such a strong commitment, by successive provincial governments, to ensure public input in the development of a major project such as this.

The Authority has demonstrated that it will continue to be sensitive to the concerns of the residents directly affected by the Project. To do otherwise would compromise the Project intent, which remains essentially to serve and to enhance opportunity in the basin.

Of paramount importance to residents of the Souris River Basin and to the Souris Basin Development Authority is that sound water management is undertaken with continued public consultation and support, such that economic and quality of life objectives are applied to local and corporate advantage.

SUMMARY OF TECHNICAL ASSESSMENTS

As part of the Environmental Impact Assessment process, the Authority is required to identify and to assess those physical features of the area surrounding the Project which will influence the Project and upon which the Project will have influence. In the case of Rafferty/Alameda, the physical features of principal concern were those of the composition, structure and development of the earth in the area (Geology and Mineral Resources); the occurrence of surface and ground water, its utilization and its functions in modifying the earth in the area (Hydrogeology); and the distribution of water on the surface and underground and the cycle involving evaporation, precipitation and flow in the area (Hydrology).

In addition, the Authority undertook analysis of the current water quality of the area and factors which influence it (Water Quality); analysis of the surface layers of earth in the area (Soils); and analysis of plant life in the Area (Natural Vegetation). In all cases, these analyses were reviewed and assessed relative to potential short and long-term project impacts.

These technical analyses and assessments confirm that the physical features of the area have sufficient tolerance to accommodate the Rafferty/Alameda Project. The dams and appurtenances can be engineered and constructed in a fashion compatible with the existing geology. Mineral resources in the area can be extracted prior to inundation and/or applied to the construction. The Authority is committed to an integrated oil well mitigation program which is designed, on the one hand, to minimize the impact the reservoir will have upon existing facilities, and on the other, to ensure that the environment is adequately protected.

Water quality within the reservoirs is forecast to be suitable for all intended uses and will be similar to other southern Saskatchewan reservoirs. The effect of the Project on the groundwater regime in the area will be positive and in some cases water quality will improve. Based on historical records water stored in the reservoirs will be sufficient to maintain existing consumptive water uses downstream, and to maintain the water requirements at Shand. While water levels in both reservoirs will fluctuate due to naturally occurring periods of high and low precipitation and runoff, this factor has been taken into account in the development of recreation alternatives and in the design of mitigation alternatives. Fluctuation over the course of each summer season is also well within acceptable limits. Soils suitable for irrigation exist within the Project Area and strategic application to lands designated as favorable has been recommended. None of the vegetation types within the Project area are considered unique or endangered.

SUMMARY AND DISCUSSION OF PROJECT RELATED ISSUES

The EIS discusses elements relating to the lifestyle and the area's economic activity, in Transportation, Land Use and Irrigation. In each, the issues are identified and proposed mitigation of project impact is described.

Fundamental to the environment, the habitat of animal life within the project area has been assessed and mapped. In addition, extensive baseline studies of Wildlife and Fisheries have been completed; others are currently underway for the downstream Souris River area and more are proposed as components of future mitigation. The mitigation measures proposed by the Authority are comprehensive and in the context of Saskatchewan, unprecedented in scope.

Heritage Resources within the areas of the reservoirs have been identified and assessed by provincial authorities over a period of years. The resulting plan for inventory, assessment and mitigation will not only minimize project impact upon heritage resources but will significantly accelerate archaeological research in the area. Barring an unforeseen major find which, based on existing knowledge of the area, is not anticipated, these are costs which will be borne by the Authority.

While the project represents some disruption to lifestyles of those who live in the area, it also presents an opportunity for enhanced quality of life, particularly in Recreation. The EIS proposes maximum use of the recreational potential of the resulting reservoirs and the downstream reaches of the river and suggests numerous ways in which the new facilities can be developed complementary to the provincial tourism development strategy. Many of these suggestions have been supported by authorities and commercial bodies within the tourism sector.

In summary, the Authority is of the view that new development, adjustment and compensation measures can be applied such that most if not all project impact can be successfully mitigated where it can not be turned to advantage.

TRANSPORTATION

The reservoirs at Rafferty and Alameda will inundate several existing roadways and bridges. Some of these roadways are Primary Grids with average daily traffic volumes up to 300 vehicles, as at #606 adjacent to the Dr. Mainprize Regional Park. Other roadways are of lesser significance providing access primarily for local agricultural activities. Without mitigation of these inundated roadways, residents of the municipalities as well as through-traffic would be inconvenienced and, in cases, experience considerable hardship.

Although the Alameda Reservoir will be approximately one-half the length of the Rafferty Reservoir, the potential impact on existing roadways will be equivalent, reflecting the more extensive historical traffic movements across the Moose Mountain Creek in the Rural Municipality of Moose Creek. Farm settlement and cultivation in the Rafferty Project Area have been more restricted along the Souris River Valley due to the extreme stoniness of the adjacent uplands.

The Souris Basin Development Authority recognized that it would not be economically feasible to elevate roads or construct causeways or bridges at all identified locations. In order to recommend viable mitigation options for each Project Area, the Authority conducted an engineering assessment and pre-feasibility review of all identifiable options. The resulting assessment for transportation related mitigation resulted in the selection of the most cost-effective and use-sensitive options.

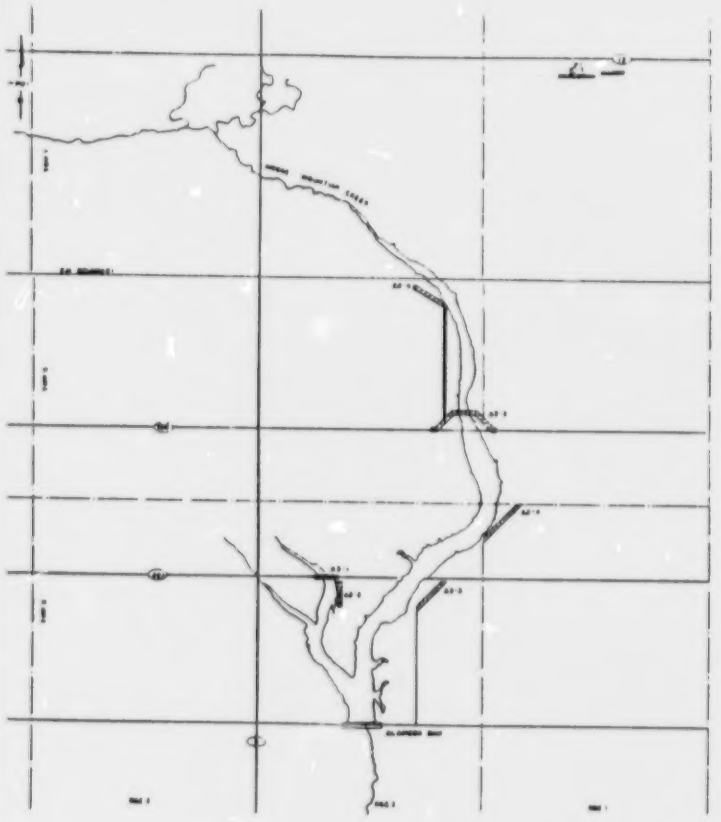
LAND USE

In the Study Area, the pattern of land use is principally one of agriculture complemented by other activities where resources and economics have so dictated. Superimposed on this system is a transportation system which has evolved to accommodate the types and volumes of flows within the region.

Land use in the valley is heavily influenced by the natural characteristics of the land itself. Steep, rocky slopes are currently suitable only for extensive cattle grazing and wildlife. The floodplain is more useful for agricultural endeavors. In the reaches above the Estevan-Cambria pasture, land is somewhat higher and better drained, lending itself to cultivation. In the lower reaches, the floodplain is low and poorly drained, subject to flooding and periods of inundation, and agricultural capability is limited to production of perennial forage crops.

The Rafferty Reservoir will flood some lands currently used for agricultural purposes. Based on the cultural and ecological land type, aerial photo interpretation and classification, 10.? percent of the land to be flooded is now used for cereal crop production, 24 percent for forage crop and hay production and the majority, 48.1 percent is used for grazing of cattle. Approximately 17 percent is currently either not used for or capable of being used for agricultural purposes.

Precise calculations of land use, by type, will vary from year to year. During and following a series of wet springs and summers; for example, cereal



ALAMEDA DAM

RAFFERTY DAM

FIGURE 10

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY / ALAMEDA DAMS
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
CAUSEWAY AND ROAD
LOCATIONS

PROJ A435 | UNIT 140 | FIG RVR | DRG NO 002 | REV A

crop and hay crop production are reduced; many acres of the valley floodplains are inundated reducing the growing and frost-free periods for cereals and making some lower hay lands inaccessible.

Approximately 24 private land owners will lose cereal crop and hay lands on the floodplains of the Souris Valley and Roughbark Creek. In addition, a number of provincial Crown land lessees will have to surrender their leases. All landowners and Crown land lessees will be compensated for their land, including disruption allowances and payment for improvements such as fencing. The Authority has developed a land acquisition policy which sets out the evaluation procedures and pricing policies which will be used. This policy is very similar to other land purchase policies used by the Government of Saskatchewan for other major projects. Some private agricultural landowners will have options as to the time of actual sale, payments in lieu of leaseback, and whether additional adjacent lands would be offered for sale due to disruption of the farm/ranch operation. As it cannot be predetermined what the actual preference or decision of each landowner or lessee will be, it is not possible to quantify the actual disruption to farm units throughout the length of the reservoir.

Adequate and 'fair' compensation to private landowners and lessees will ameliorate those social costs of the project resulting from land use disruption. The Authority will endeavor to have adequate grazing land provided on one side of the reservoir or the other to ensure that no real cost from an agricultural point of view must be borne unfairly. The transition or adjustment period need not cause undue hardship to individuals in either the short-term or the long-term. Lands actually lost to the reservoir may represent a perceived loss to agriculture, but the industry will acquire net benefits derived downstream through new irrigation and farming opportunities.

COMMUNITY PASTURES

Without mitigation, the combined impact of the reservoir on the three community pastures would be a carrying capacity loss of 434 cattle. This represents a reduction of 11.8% from the current combined carrying capacity of 3,675 cattle for the three pastures. With ninety patrons served in 1986, an 11.8% reduction could mean the potential exclusion of ten patrons. Requests for grazing already exceed current stocking rates and this loss could be critical. The alternatives of improved management practices and acquisition of replacement lands will be pursued by the Authority.

The carrying capacities noted for the three pastures are currently much higher than the actual current stocking rates. While the calculated carrying capacity of the three pastures was 3,675 cows (with or without calves), the current extended drought has reduced the acceptable stocking rates to 2,443 cows, a drop of 1,232 head or 33.5 percent. This reduction is nearly three times as severe as would normally be lost due to the creation of the Rafferty Reservoir. In fact, using the current stocking rates for the three pastures, the lost land bases for each would translate into lower stocking of Estevan-Cambria pasture by 143 head, Lomond #1 by 41 head and Midale SDA by 146 head for a total reduction of 330 cattle. This is only 9 percent of the total calculated long term carrying capacity of

3,675 cattle for the three pastures combined. This number of cattle (330) is less than that currently being trucked to the three pastures from beyond 20 km radii. In other words, local patrons need not be negatively affected at all if more distant patrons can be accommodated elsewhere, closer to their farms.

The loss of some community pasture lands will not be significant relative to the long-term impact of droughts in the Study Area during which stocking rates must be cut dramatically. Creation of the reservoir may result in localized increases in precipitation and decreased evaporation and evapo-transpiration, resulting in long term increases in carrying capacities and stocking rates. This combined with irrigation, improved rangeland management and fertilization may offset the actual losses of the land bases in the pastures to the Rafferty Reservoir.

In order to minimize the impact of the Rafferty project on the pastures, the Authority will undertake to replace the lost land base through acquisition of an equal amount of suitable adjacent lands. Some Crown lands already under grazing lease could be added to the pastures over the long term when current lessees terminate their use of the land. Other private land owners may prefer to sell land for inclusion in the pastures.

IRRIGATION

Agriculture is one of the beneficiaries of the proposed Rafferty and Alameda Projects. Agricultural opportunities are presently limited by the sub-optimal rainfall during the growing season in most years. Some irrigation occurs in the basin now, mostly as a fodder base for livestock operations in the area. The majority of existing irrigation in the Rafferty Project Area occurs in the R.M. of Estevan; there is no significant irrigation currently taking place in the Alameda area.

Available water for irrigation is limited as most of the stream flow on the Souris River and its tributaries occurs during spring runoff. Flows are highly variable with extreme flows and floods some years and little or no flows in others. The Rafferty and Alameda reservoirs will provide more reliable supplies during periods of high irrigation demand and allow for significant increases in potential irrigated land.

Irrigation development scenarios prepared for the Authority indicate that the lowland irrigation areas would provide the greatest economic return on investment. 4,855 ha (12,000 acres) of irrigation are projected with two-thirds of this in the Souris River lowlands and one-third in the Alameda uplands. Although upland irrigation in the Rafferty project area is physically feasible, very little, if any, is anticipated there in the foreseeable future and no provision for such has been made by the Authority.

It has been determined that a 100 percent firm yield of water is neither necessary nor desirable. Availability of irrigation water 70 percent of the time enables a six fold increase in the potential irrigatable area. This policy is consistent with stated supply policy in Alberta as recommended by the Environment Council of Alberta.

As there is much more irrigable land in the Project Areas than there will be available water, only the best lands are anticipated for irrigation development. Technical advice provided to the Authority indicates that there are in excess of 18,300 ha of Class 2 (good) potential in the Rafferty area, and in excess of 31,400 ha of Class 1 and Class 2 irrigatable land in the Alameda area. Although the land may be physically suitable for irrigation, economic feasibility will dictate whether or when the development of these lands actually takes place. Technical reports provided to the Authority indicate that 1,442 hectares of Class 2 and 2,479 hectares of Class 3 lands in the Souris River Valley lowlands are likely to be among the first to be irrigated. There should be no need for conflict between wetlands, oxbows, and forest lands adjacent to or within meanders of the river. These lands were deemed to be Class 4, either poor or unsuitable for irrigation.

It is to be noted that lowland irrigation requires less water in an average or peak year. The Saskatchewan Water Corporation has advised that whereas 450 mm (18 inches) of irrigation water is required in peak years in upland areas to account for on-farm and distribution losses, wastage and leaching, as well as the crop needs, 300 mm (12 inches) of irrigation water is necessary on lowland irrigation plots. This results in a greater net return in the lowlands relative to the irrigation water requirements.

FISHERIES

Any alteration to the existing environment results in impact upon the ecosystem. The change of riverine habitat to lacustrine or lake-type habitat has significant implications for the aquatic resources which presently utilize the system. In the case of the Rafferty Reservoir, the headwater habitat of the Souris River system will undergo such a change. In this instance, a relatively small (but relatively heavily used) existing reservoir (Dead Lake) and riverine fishery for northern pike, yellow perch and stocked walleye will be transformed into a larger lacustrine fishery. Given the high priority placed on the development of the new fishery, and the mitigation and enhancement measures which will be incorporated into project design, non-mitigable impacts and environmental trade-offs in relation to the fisheries resource are few.

One of the goals of the Project is a significant improvement in fishery values, to the point that a desirable water-based recreational opportunity is created. Potential drawbacks to the development of these opportunities have been identified in the analysis and these illustrate the Authority's awareness of possible problems. The issues are common to the majority of newly-created reservoirs, and a vast body of knowledge exists relating to techniques which may be employed to ameliorate the identified concerns. The Souris Basin Development Authority is committed to incorporating the necessary mitigative options into project design and operating guidelines to meet the objective of a high-quality recreational fishery in the Rafferty and Alameda Reservoirs, and downstream Souris River.

Similarly, the Authority is committed to undertaking mitigation enhancement, and monitoring activities to maximize the potential sport fishery associated with the Rafferty Reservoir. These activities and estimates are pending

the results of the long-term Fisheries Management Plan. The Authority is committed to a significant expenditure for fisheries mitigation/enhancement. This is based on assumed requirements for a long term Fisheries Management Plan, with monitoring activities; feasibility assessment of rearing pond development and stocking of various species (over 5 years); piers, wharfs, boat launch ramps; shaping of gravel terraces/shoals prior to inundation; other fish habitat/rearing improvements; and development of artificial reefs.

WILDLIFE

Southern Saskatchewan supports a diverse community of birds, mammals, reptiles and amphibians, either as residents or seasonal migrants. These are representative of a mixed grass prairie environment that has been extensively altered by agricultural activities and other cultural developments. The Study Area contains substantial areas of suitable habitat, most of which will not be inundated by the proposed Rafferty/Alameda Reservoirs. Where inundation will occur, the potential impact of the proposed reservoirs and associated works must be considered.

Almost all of the land to be inundated by the Rafferty reservoir is critical Sharp-tailed Grouse habitat, but it represents less than ten percent of all of the critical Sharp-tailed Grouse habitat on both sides of the Souris River Valley between Weyburn and Estevan. It is recognized however that this areal extent valuation may not accurately reflect the true significance of the Souris River Valley within the ecological system of Sharp-tailed Grouse. The Authority has committed itself to a three year ecological research study to obtain a better understanding of the relative importance of the area's topography and habitats for this species.

White-tailed deer and Ring-necked Pheasant habitat will be lost as well as habitat for aquatic furbearers, coyotes, and several grassland species of birds and small mammals. Therefore, additional research on the ecology of white-tailed deer and further baseline data on other species is proposed.

Impact upon species such as western painted turtles and potential changes in wildlife travel and migration routes which follow the Souris River and tributary courses is also likely to be negative. Some lands protected by the Critical Wildlife Habitat Protection Act will be flooded. These will be replaced by alternative suitable lands. A comprehensive mitigation and wildlife habitat enhancement and development program will be undertaken by the Authority to offset the losses due to the Rafferty Reservoir. Over 2,250 ha of land will be specifically protected or enhanced for wildlife, including wetlands, islands in the reservoir, lands within the community pastures, along Long Creek, downstream on the Souris River and in the Dead Lake Channel. Additional land will be improved as wildlife habitat surrounding the reservoir as there will be reduced conflicts with cattle grazing. Park land developments at the relocated Dr. Mainprize Park and the lower Rafferty will further provide new habitat for wildlife, especially for wintering deer. Attention will also be focused upon the lower Souris River Valley downstream from the Rafferty reservoir, where excellent potential exists for enhancement and protection through legislation.

PHOTO EIGHT: Ring-necked Pheasant in Flight.
(Photo courtesy: Environmental Management Associates)

PHOTO NINE: Western painted turtle (underside).
(Photo courtesy: Environmental Management Associates)

PHOTO TEN: White-tailed deer feeding.
(Photo courtesy: Environmental Management Associates)

PHOTO ELEVEN: Sharp-tailed Grouse during mating season.
(Photo courtesy: Environmental Management Associates)

Creation of the Rafferty and Alameda reservoirs will provide new staging and resting areas for waterfowl and shorebirds, thus improving waterfowl hunting, providing spectacular viewing opportunities and adding to tourism development opportunities. The reservoirs will change the species composition of the wildlife, especially birds, likely providing a greater diversity of shoreline and aquatic species. As similar developments have occurred within reasonably close geographic proximity on the Souris River System at the United States Fish and Wildlife Refuges it is highly probable that this will create, in time, a significant destination area for bird-watchers, photographers and naturalists.

Ecological research studies and mitigative measures for lost habitat will be initiated immediately upon approval to proceed with the Project. This will ensure that displaced species of Sharp-tailed Grouse will have a better opportunity to adapt to the changed environment as the reservoirs fill. Because the implications to wildlife are quite diverse, and in some cases not fully understood, the research, planning and development of a long-term wildlife management plan will start almost immediately. Organizations such as the Saskatchewan Wildlife Federation, Ducks Unlimited Canada, the Saskatchewan Natural History Society and Saskatchewan Parks, Recreation and Culture will be asked to assist the Authority wherever possible. Land negotiations, planting of food and cover plots, and tree plantations will be initiated quickly upon approval of the Project.

The Authority commits itself to undertake these mitigative and development initiatives. In addition, long-term monitoring of inputs and additional baseline gathering will be undertaken. The Souris Basin Development Authority's initial responsibility to construct the two dams and reservoirs may subsequently be amended, revised or expanded to give it a longer term mandate. This long-term management of the wildlife resources will become the responsibility of the Authority or its successor, in cooperation with other related government departments, agencies and special interest groups such as the Saskatchewan Wildlife Federation and Ducks Unlimited Canada.

While the expected impact of the Rafferty Project has been addressed in considerable detail, further baseline research and mitigative study is being undertaken before finalizing a wildlife mitigation strategy for the Alameda reservoir. In 1987, additional work is being undertaken by the Authority in this area as well as in the reach of the Souris River between the dams and the U.S. Border.

HERITAGE RESOURCES

The material presented is derived from a series of Heritage Resource Impact Assessments conducted by the Saskatchewan Research Council (SRC) in 1984 and in 1986. The work presented reflects the results of over four hundred days of professional field work in addition to a thorough analysis and assessment of other related sources of information.

The Study Area has a rich archaeological heritage. Although the recovered sites span approximately the last 7,700 years of human occupation in the Souris

Basin, previous research suggests that the Souris Basin could have been occupied much earlier than this. There is some evidence to suggest that this area was exploited by both full-time plain's bison hunters and seasonal hunters/horticulturists from the Middle Missouri region (probably the Hidatsa). Potential as a zone of cultural interaction adds to the unique character and research interest of the region's heritage resources.

The later settlement history presents additional opportunities for study. The range of historic structures extends from isolated structures, to complete farmsteads, to a small industrial community. While the range of surviving archaeological remains is quite limited, there is still the opportunity to study turn of the century life through this set of material culture remains.

Evaluation of the significance of currently recorded heritage resources suggests that these resources have the potential to address a wide range of scientific problems. Equally important, a number of the resources are rated highly in terms of public significance, suggesting that they can contribute to a sense of time and place for the local community and beyond.

It is the view of the Authority that, by more fully documenting the heritage resource base, and with a properly funded, properly designed mitigation program and a long-term monitoring program, the overall effect of these impacts can be diminished. Such studies of the heritage resources in these areas would lead to a substantial benefit in terms of scientific knowledge. Equally important, by looking at the educational and recreational benefits of specific heritage resources, considerable public benefit could be realized.

Based on the available level of baseline data and the available information on reservoir and construction impacts, a number of recommendations for mitigating these impacts are proposed.

The Archaeological Resource Management Section (ARMS), Heritage Resources Branch, Saskatchewan Parks, Recreation and Culture has assisted the Souris Basin Development Authority in preparing required Terms of Reference for an Archaeological Impact Management Program. The objectives will be to: 1) identify the majority of archaeological and historic resources in the Project Area; 2) assess a representative sample of those resources; and 3) mitigate impact upon a representative sample of resources demonstrated by the assessment program to be of importance to the understanding and appreciation of the prehistory and history of southeastern Saskatchewan.

The Authority undertakes to ensure that the Impact Management Program will be carried out in accordance with current standards of archaeological/historical research and resource management such that substantive gains to knowledge in these fields is achieved. The program will be undertaken in accordance with a project research design prepared in consultation with ARMS.

PHOTO TWELVE: Ratigan Tipi Ring Site - DhMs10.
(Photo courtesy: Souris Basin Development Authority)

PHOTO THIRTEEN: Historic Foundation.
(Photo courtesy: Saskatchewan Research Council)

PHOTO FOURTEEN: West end of second island to be created southeast of McDonald Lake (upper right), looking northwest. Note absence of trees and concentration of boulders along the eroded channels. Entire area shown is important habitat for Sharp-tailed Grouse.

(Photo courtesy: Saskatchewan Power Corporation)

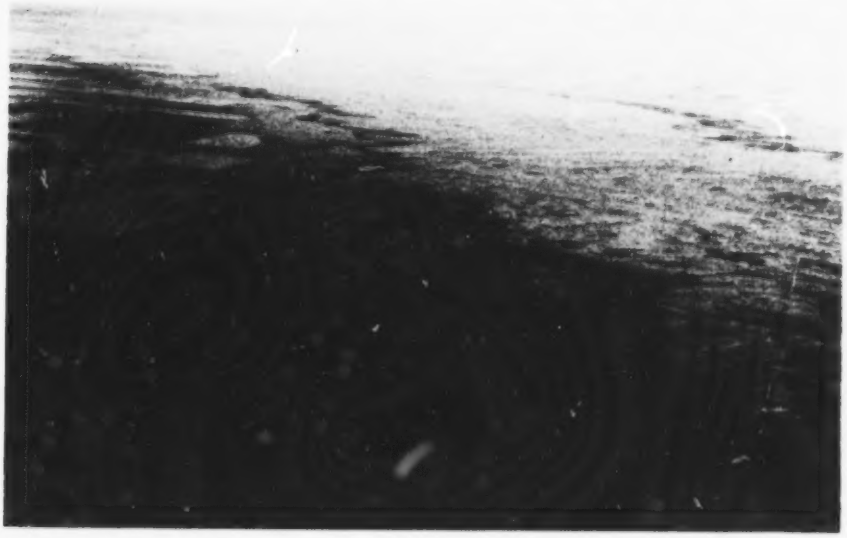


PHOTO FIFTEEN: Washed Moraine bordering the Souris River (background) Roughbark Creek (foreground) in Lomond #1 PFRA Community Pasture. This Land system remains almost entirely in native vegetation and is critical habitat for Sharp-tailed Grouse throughout.

(Photo courtesy: Saskatchewan Parks, Recreation and Culture)

PHOTO SIXTEEN: Oxbow Weir on Souris River effectively blocks fish movements during low flows. April, 1987.
(Photo courtesy: Environmental Management Associates)

PHOTO SEVENTEEN: CPR weir on Souris River in Woodlawn Regional Park, Estevan. April, 1987. Weir serves as walkway between swimming pool, north of river and campground on south side.
(Photo courtesy: Environmental Management Associates)

PHOTO EIGHTEEN: Limestone erratic boulder deposited by glacier into Souris River Valley west of Halbrite. Boulder sits precariously on pedestal of clay.
(Photo courtesy: Souris Basin Development Authority)

PHOTO NINETEEN: This area is very unique and extremely sensitive, worthy of protection and interpretation. The area requires controlled visitation in order to protect the natural landscape and the visitors. Uncontrolled or indiscriminate climbing or traffic would court disaster.
(Photo courtesy: Souris Basin Development Authority)

RECREATION

The Rafferty Reservoir will be approximately 57 km long and up to 15.1 m deep at Full Supply Level. The Alameda Reservoir will be approximately 27 km long and 24 m deep at Full Supply Level. These two new reservoirs will more than double the surface water area in the Study Area creating much needed new water-based recreational opportunities. Heavy use of both reservoirs is expected. The riverine environment downstream from the dams will benefit as well from increased and more stable Souris River flows in summer months.

The public has great expectations for development of recreational facilities. The communities of Estevan and Weyburn, as well as smaller communities and farm families in southeastern Saskatchewan, as well as neighbouring North Dakota, are starved for water-based recreation. Many area residents who attended Open Houses held in the Spring of 1986, sponsored by the Authority, indicated they had to travel over 100 km to the Qu'Appelle Valley to go fishing and to the overcrowded Moose Mountain Provincial Park for waterskiing, boating and other types of water sports. Many who have cottages at Kenosee and White Bear Lakes indicated a desire to move to the new reservoirs.

The key to maximizing the recreational potential of these reservoirs lies in the development of high quality support services, infrastructure and good accessibility. Integrated land management planning which recognizes and protects fragile backshores, wildlife habitat and populations, unique ecosystems, adjacent landowner privacy and needs of the public must be undertaken immediately. Sufficient space for park land development with adequate use areas, buffers and integrated traffic corridors is required.

Demands for certain lands such as the islands in the Rafferty Reservoir and prime parcels around natural harbours or scenic promontories must be anticipated. Divergent and often conflicting interests will be expressed in lands around the reservoirs. Decisions will have to be made in conjunction with local governments regarding land and water use restrictions, zoning and building controls, enforcement procedures and management responsibilities.

Following the final identification of appropriate locations for boat launching, marina, camping, picnicking, wildlife viewing, swimming and cottage area sites, detailed plans will have to be prepared. The Authority will oversee the preparation of such plans.

In addition to planning for the needs of the public in terms of access, facilities and services, the Authority will undertake necessary planning for private investment opportunities in the form of outfitting for fishing and hunting, houseboat rentals, resort developments and cottage areas.

In recognition of the anticipated recreational demands, the Authority has committed itself to assisting the Saskatchewan Parks, Recreation and Culture department in the development of park lands in the lower Rafferty area and also the Alameda Reservoir. Additional funds have been set aside for isolated boat launches, piers, fish filleting, picnicking facilities and public washrooms at seven selected locations on both reservoirs. Provision has also been made for

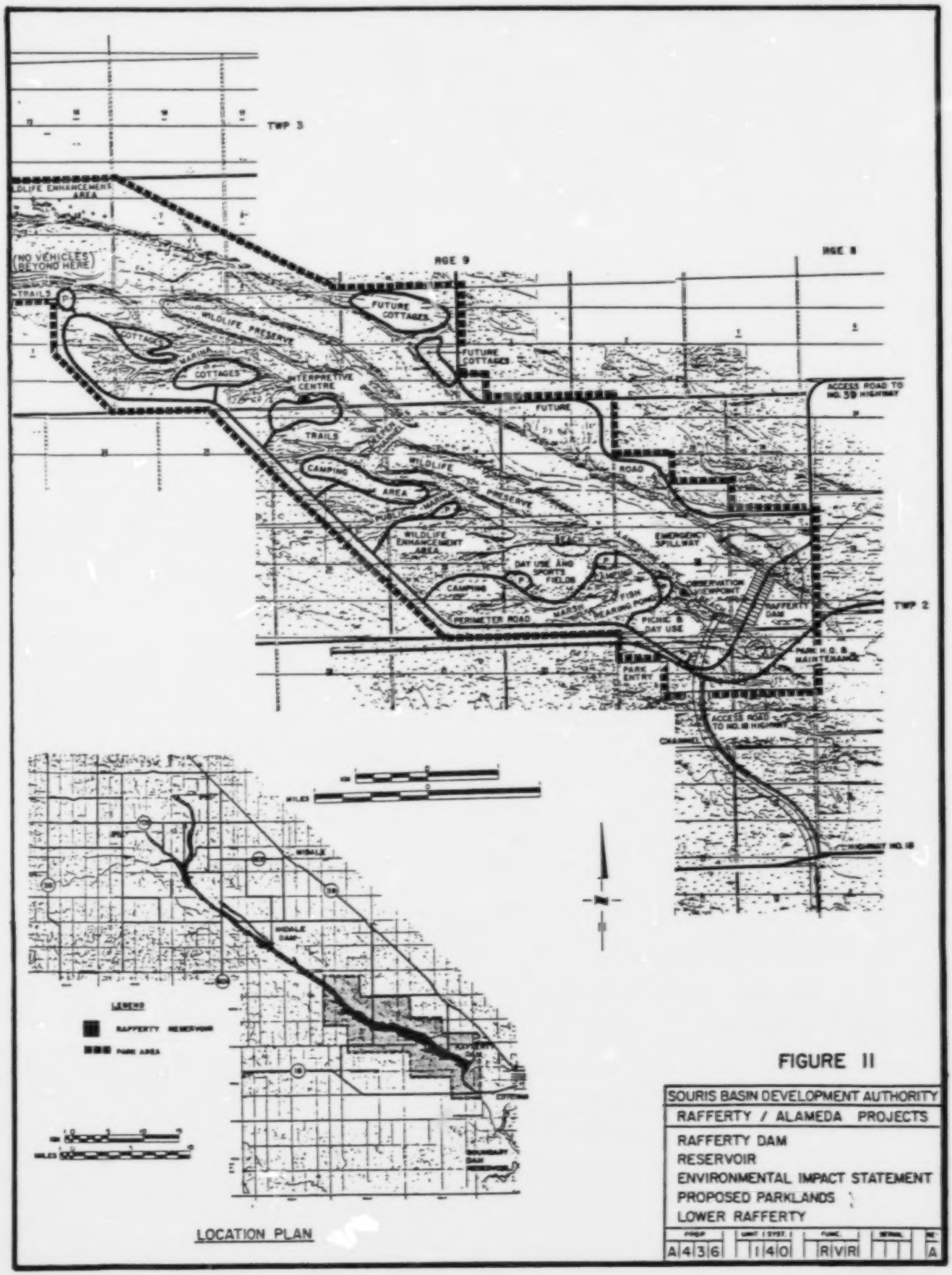


FIGURE II

SOURIS BASIN DEVELOPMENT AUTHORITY				
RAFFERTY / ALAMEDA PROJECTS				
RAFFERTY DAM RESERVOIR ENVIRONMENTAL IMPACT STATEMENT PROPOSED PARKLANDS LOWER RAFFERTY				
PROJ	UNIT	FUNC	DETAIL	NO.
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interpretive, viewing, public facilities at the Primary Grid #705 wetlands, for the "Valley of the Rocks" acquisition and interpretive facilities west of Halbrite and for the mitigation and enhancement of the Dr. Mainprize Regional Park.

The need for 175 cottage lots is anticipated at Rafferty plus 100 more at Alameda. All of the required expenditure will be undertaken by private developers. The Authority has not attempted to identify all potential park, recreation, tourism or private investment opportunities associated with the Rafferty/Alameda Project. It has, however, anticipated the need for enhancement of the natural characteristics of these new large water bodies for the long term benefit of the public. Public demands and access for fishing, hunting, cottages and a variety of related water and land-based activities have been recognized and balanced with the need to protect and enhance wildlife habitats, breeding and rearing areas, environmentally sensitive areas, public safety factors and other environmentally related resource management objectives.

LUTHERAN BIBLE CAMP

The Lutheran Bible Camp adjacent to the Souris River in the Rural Municipality of Cymri #36 will be inundated by the Rafferty Reservoir when it reaches an elevation of approximately 546.5 metres, 3 metres below Initial Operating Level. During surcharges of the reservoir to contain spring floods, it could be covered by up to 7.5 metres of water. The existing camp will have to be relocated.

Initial discussions with the Lutheran Bible Camp representatives indicate that no decision has been made regarding future plans in the event that the Rafferty Project proceeds. It is understandable that the Bible Camp will require considerable time to fully evaluate their alternatives prior to making any decisions or commitments.

If the Rafferty Project proceeds and the Lutheran Bible Camp Association chooses to relocate their camp to a site other than in the Souris River Valley, appropriate compensation for the flooding of the existing campsite will be paid by the Souris Basin Development Authority.

The Authority has advised the Bible Camp representatives of future long-term plans for recreational, tourism, wildlife enhancement and educational developments associated with the Rafferty Reservoir and of the resulting benefits. In addition to the current camp offerings and programs there would be opportunities to take advantage of new and improved facilities at the relocated Dr. Mainprize Regional Park as well as the various water-based recreation activities (sailing, canoeing, fishing). Wildlife viewing, nature interpretation, hiking and exploring can be popular future camp activities as well.

The Authority has attempted not to "sell" the Project to the Bible Camp representatives, fully recognizing that the preferred option of the Camp owners and visitors may be to leave the camp exactly as it is and where it is. The Authority has indicated its willingness to make every effort to arrive at a suitable negotiated settlement. As it will likely be some time before inundation occurs,

there will be no immediate pressure put upon the Bible Camp Association to reach a decision.

DR. MAINPRIZE REGIONAL PARK

Dr. Mainprize Regional Park was one of Saskatchewan's first Regional Parks. On July 28, 1959 this local community park was dedicated to honour Dr. William Graham Mainprize whose medical practice had served the area for nearly half a century. Early development of the park was characterized by the active involvement of many local volunteers. Dr. Mainprize created unique and picturesque structures for this park and it has been a focal point for regional recreation.

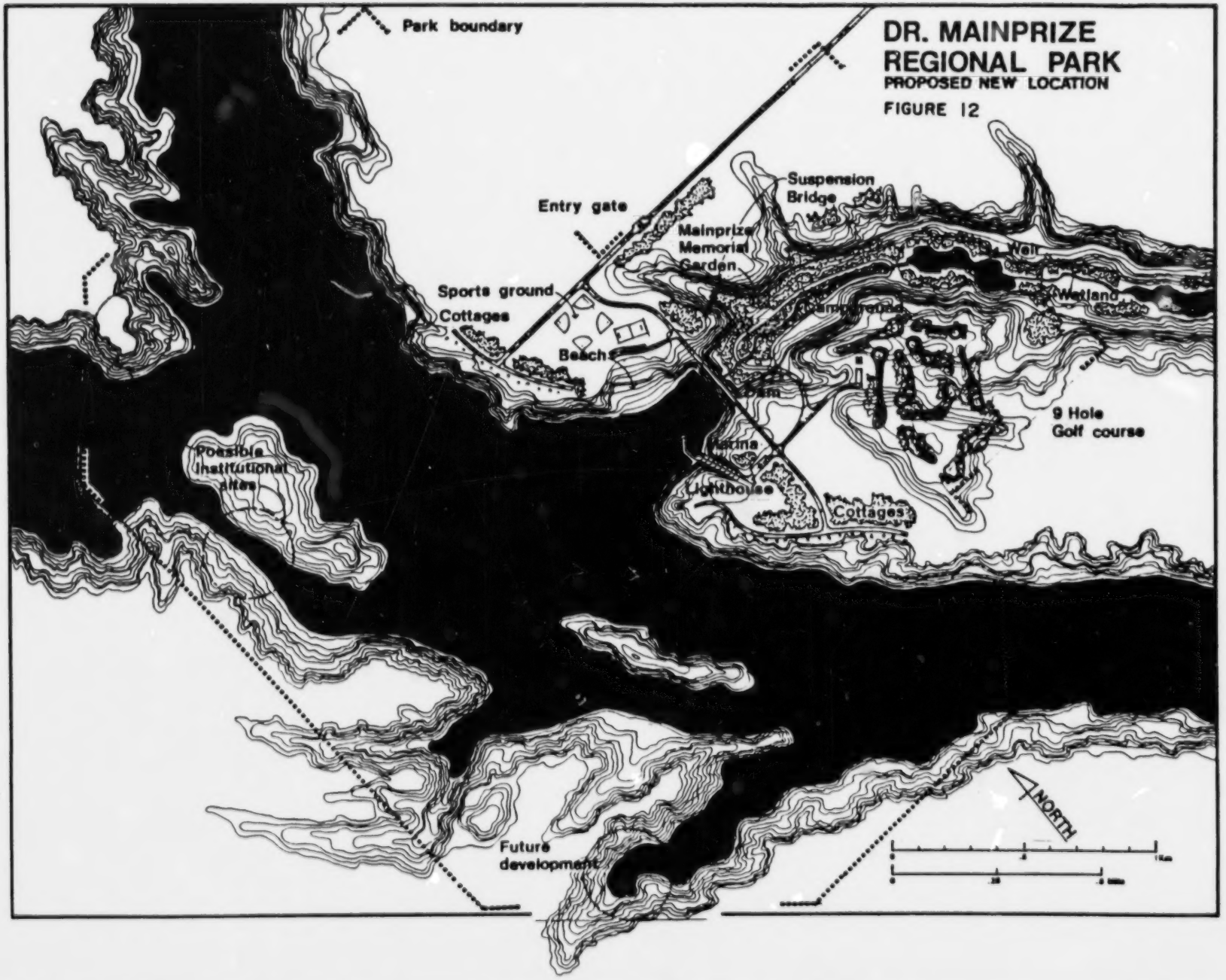
When the Rafferty Reservoir reaches an elevation of 541.5 m, the park will be inundated. The Regional Park Board, following consultation with the Authority, has decided that should the Project proceed, it wishes to relocate the park rather than close it down or seek compensation. There is great sentimental attachment to the park, particularly among older residents of the area who were involved with its creation and worked closely with Dr. Mainprize. In recognition of this, the Souris Basin Development Authority is committed to the relocation and upgrading of Dr. Mainprize Regional Park. Significant funds will be spent on the new Park, excluding land costs and the eastern and western 'closure dams'. In addition, a maintenance trust fund will be established to assist the Park Authority with the additional costs associated with re-establishing their golf course fairways, tree plantations and newly landscaped areas. This fund will be in addition to the funds normally provided through the cost-sharing agreements with the provincial government.

While the current depreciated value of the existing Regional Park is considerably less than the reconstruction cost, the additional expenditures are warranted. Dr. Mainprize Regional Park is much more than the sum of its physical assets. The Park is an extremely important historical land mark in the region honoring a great man who gave 60 years of his life to the people of the surrounding municipalities. This tribute to Dr. Mainprize's dedication and the honor bestowed upon him in July, 1959 should not be lost. Relocation and rededication of the Park will ensure that the ideas associated with the creation of the park will be upheld for generations in the years to come.

The Souris Basin Development Authority is recommending to the government that the lake created by the Rafferty Dam be named Mainprize Lake. The Authority has discussed this recommendation with, and obtained the approval of, Dr. Mainprize's immediate family and the Mainprize Regional Park Board.

SOURIS BASIN PLANNING CONSIDERATIONS

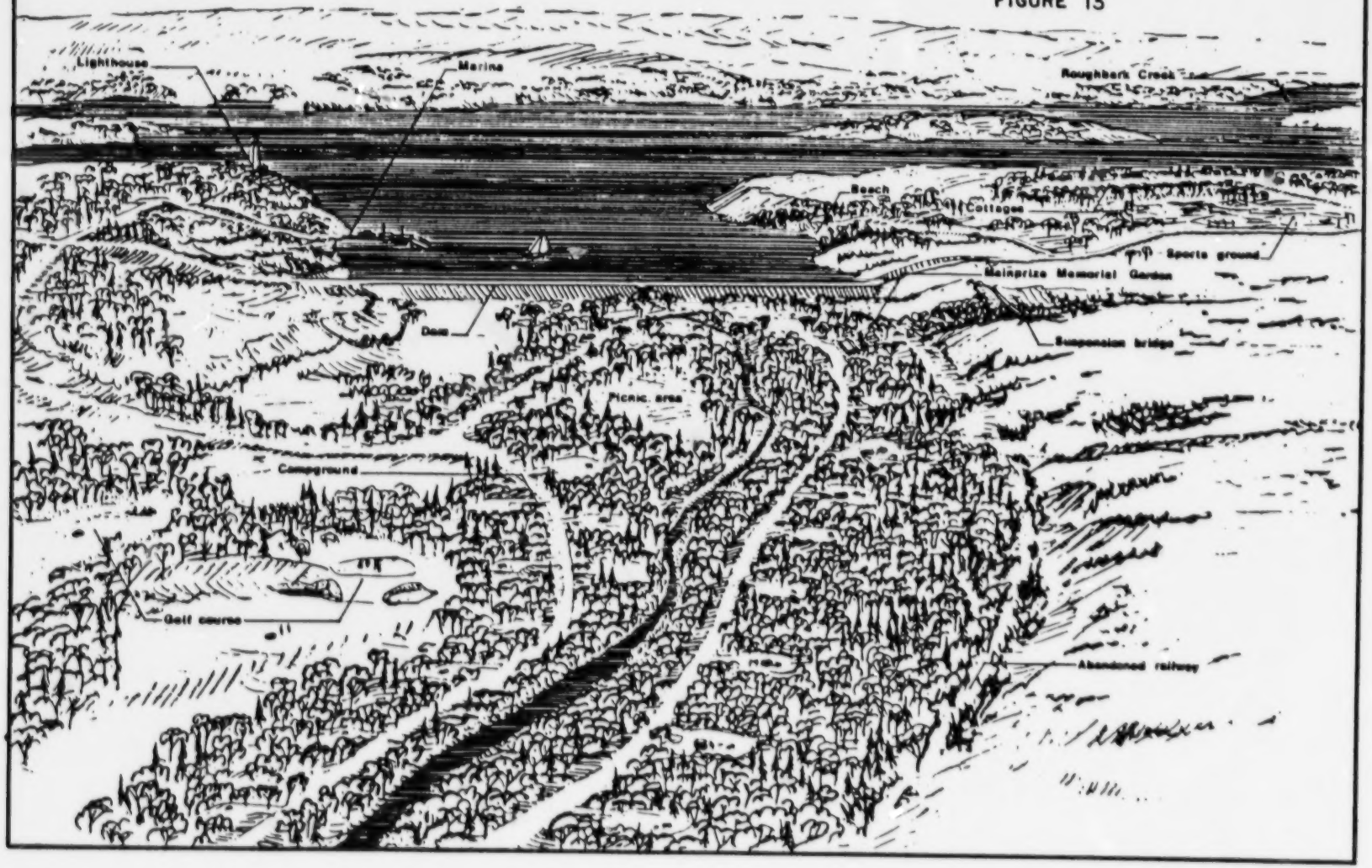
As a complex multi-purpose project with long-term water and land management implications, attention must be given to the development and implementation of an integrated basin management plan. The elements of such an overall plan involve the reservoir operating plans, wildlife enhancement and


DR. MAINPRIZE
REGIONAL PARK
PROPOSED NEW LOCATION
FIGURE 12
Park boundary
Entry gate
Suspension
Bridge
Mainprize
Memorial
Garden
Sports ground
Cottages
Beach
Wetland
9 Hole
Golf course
Possible
institutional
sites
Marina
Lighthouse
Cottages
Future
development
NORTH

DR. MAINPRIZE REGIONAL PARK

VIEW FROM THE EAST

FIGURE 13



mitigation plans, fisheries management plans, downstream ecosystem protection and management, land uses and administration and responses to social and economic needs of the people in the basin. Many of these elements will be in place following completion of the projects, but there will be a continuing need to integrate these elements over the long term.

There are many concerns of interest groups and legislated agency responsibilities which must be brought together in the planning process. These include local interests by landowners and the municipalities involved and special interest groups such as the Saskatchewan Wildlife Federation, Ducks Unlimited Canada and the Saskatchewan Natural History Society. In addition to the Souris Basin Development Authority's initial short term mandate, provincial responsibilities are represented by the Saskatchewan Water Corporation, Saskatchewan Environment, Saskatchewan Agriculture, Saskatchewan Parks, Recreation and Culture, the Saskatchewan Power Corporation and others. With such a diversity of interests and responsibilities, development of a long term integrated basin management plan will take time, effort, cooperation and understanding. The task is neither simple nor quickly completed but it is necessary, achievable, and very worthwhile.

As indicated in the Land Use section of this Statement, it is suggested that Reservoir Development Areas should be established around the Rafferty and Alameda reservoirs. Future inclusion of the Boundary Reservoir on Long Creek would also be appropriate to achieve greater uniformity in dealing with the overall Souris Basin management objectives. The existing Boundary Reservoir would appear to be a good example of the results of no overall management plan. There is confusion amongst the public as to the responsibilities of Saskatchewan Power Corporation, Saskatchewan Parks, Recreation and Culture, Saskatchewan Water Corporation, the Rural Municipality of Estevan and the Estevan District Planning Commission. Responsibilities for land and water use controls and development around the reservoir are not clearly defined.

This Environmental Impact Statement has attempted to identify and deal with the potential environmental and economic impacts of the Project. Specific mitigation plans have been described in the wildlife, fisheries, land use, mineral resources, transportation, recreation, heritage resources and other sections. Short term and long term monitoring requirements are also addressed. As the Authority's current mandate is limited to the planning, design and construction of the dams, reservoirs and related appurtenances, many of the monitoring and mitigation efforts must become the commitments of a subsequent responsible agency. An administrative body with longer term responsibilities must follow this current mandate of the Authority. It would be inappropriate to specify the structure of such a subsequent administrative body at this time without the direct input of the local municipalities, interest groups and other government agencies. Creation of such a body must necessarily follow the decision to proceed with the Project and follow through with the various mitigative and monitoring activities. Clearly it must become the responsibility of an agency with a long term mandate to integrate the reservoir operating plans, the various mitigation plans, land use controls, and public and private developments into a comprehensive Souris Basin Management Plan. The purpose of the plan will simply be to integrate predicted water demands and flood control requirements with optimal ecosystem management and optimal

economic development in the Saskatchewan portion of the basin area. At this point in time, the Authority can do no more than recognize these long term needs and, as proponent of the Project on behalf of the government, commit the government to developing an appropriate administrative body which will adequately respond to these needs.

SUMMARY

The Rafferty/Alameda Project as described in this Executive Summary and the accompanying Environmental Impact Statement represents the culmination of years of effort by residents of the Souris Basin in Saskatchewan to acquire the ability to manage their water resources. Alternating periods of flooding and drought have created difficult, if not impossible conditions for those who must live and make a living in the area.

Certain events have coincided to make the construction of water control facilities on the Souris River much more easily attainable than at any time in the past fifty years. The identification of and emphasis on water as a development resource by the Government of Saskatchewan, the decision to build the Shand Power Station by the Saskatchewan Power Corporation and the desire by the United States to acquire flood protection for North Dakota and contribute approximately 50% of the funds for constructing the facilities in Saskatchewan have all combined to present, in historical terms, an unprecedented window of opportunity which, if lost, will likely never been seen again.

The fact that the timing of these essential elements has coincided has meant that the Project had to be developed, more quickly than would normally be the ycase. The best illustration of this is the fact that the U.S. Army Corps of Engineers historically, on average, has required eighteen years from conception of design to completion of construction for a project such as Rafferty/Alameda. Should approval be obtained to construct the Rafferty and Alameda Dams, it will have taken eight years from initiation of design work to completion. Given these time lines, it has not yet been possible to collect all of the desirable baseline data that would have otherwise been acquired if time had permitted. This is particularly true in the case of some of the wildlife studies where the tight time lines and the unseasonably mild winters have prevented acquiring comprehensive and complete baseline data.

Notwithstanding these constraints, the Authority has attempted to acquire as much information as was possible, and where substantive deficiencies existed, it has made a procedural commitment to rectify the situation. As with any land based project of its size and complexity there are negative aspects which will result from its development. The mitigation commitments being proposed adequately deal with the known negative impacts and, in some cases such as wildlife, the program is without precedent in Saskatchewan.

The multiple objective nature of the Project provides a variety of benefits not only for residents of the Basin but for the entire province. Recreation, flood control, industrial water supply, municipal water supply and irrigation are the major benefits which will accrue as a result of its development.

RAFFERTY/ALAMEDA
ENVIRONMENTAL IMPACT STATEMENT
(EIS)
REVIEW COMMENTS

Saskatchewan Environment
and Public Safety

August, 1987

1. INTRODUCTION

The comments presented in this document are the result of a careful review of the Rafferty/Alameda Environmental Impact Statement submitted to Saskatchewan Environment and Public Safety by the Souris Basin Development Authority. The review was conducted by members of the Environmental Assessment Review Panel and Saskatchewan Environment and Public Safety staff.

The EIS was examined for its technical accuracy, completeness, soundness of impact predictions and adequacy of mitigation proposals. Although comments were received from a wide variety of government departments and agencies, the conclusions and recommendations are those of Saskatchewan Environment and Public Safety.

2. OVERVIEW

2.1 The EIS has, on the whole, adequately identified the potential environmental and economic impacts of the proposed Rafferty dam and reservoir. Furthermore, the EIS has identified mitigation plans which are focussed on the predicted impacts. The mitigation plans, if carried out, will be generally

adequate. The EIS indicates commitment to these mitigation plans.

2.2 Deficiencies in the EIS are:

a) insufficient data from the area of the proposed Alameda reservoir and from the Souris River downstream from the proposed Rafferty reservoir to address the impacts at these locations adequately and to tie them to long-term impacts;

b) insufficient attention to preparing an integrated water management plan, which will take reservoir operating plans, ecosystem management and human water supply demands and flood control requirements into consideration, further tied to an overall mitigation plan. However the proponent has identified missing data sources and made commitments to filling these gaps, principally in the Alameda area and the Souris River below the proposed Rafferty dam.

2.3 Developments in the Souris Basin are subject to existing international apportionment and management arrangements administered by Canada and the United States under the Boundary Waters Treaty, and licensing requirements

under the International River Improvements Act. The conditions of the IRIA licence will require information on the project and operating plan. In particular, details will be required on the effect of the project on water levels, flows and quality at the international boundary.

2.4 The proponent is committed to the expenditure of large amounts of money for mitigation, habitat enhancement, resource management, etc. The proponent is commended for this.

3. DEVELOPMENT AND OPERATIONAL DETAILS

The description of the nature and extent of the development is clear and well illustrated. However, the timing and operation of the development is dependent upon a variety of events occurring in the desired sequence and at critical times. One such event is finalization of the apportionment agreement with the United States; another is Ministerial approval of the proposed Shand generating plant.

The proponent has developed an operational plan which outlines the expected sequence and identifies means of dealing with contingencies.

4. SOCIO-ECONOMIC CONSIDERATIONS

4.1 The economic benefits which the projects are likely to provide the local areas are substantial and long-term. These benefits include those related directly to local business and those which will be obtained directly provided increased recreational and tourism opportunities and irrigation are realized.

4.2 Provided proposed mitigation measures are implemented, the impact on oilfield activities in the project areas will be minor, but estimated costs of that mitigation will be substantial.

4.3 Rates of fill and fluctuations of water levels, both annually and cumulatively, are properly recognized as subject to variances in precipitation - an unknown quantity. It should be more clearly acknowledged that this "unknown", if carried to the worst case scenario, could affect negatively the reservoir's attractiveness for water-based recreation and the availability of water for irrigation. The proponent has acknowledged that there will be fluctuations in the

reservoir water levels, resulting in aesthetic implications.

5. WATER QUALITY

5.1 The model for post-development water quality predictions is appropriate and realistic.

5.2 The EIS indicates that elevated ammonia levels will occur in the reservoir. Implications to the living systems, during periods of bottom water oxygen deficits, may be severe at times.

5.2 The water quality impact assessment was well prepared and the data base was thoroughly considered. The model for post-development water quality predictions is appropriate and realistic.

5.3 Control of treated sewage discharges from Weyburn and Estevan was considered as a potential mitigation measure. It is our understanding that in the case of Estevan, recycling of such discharge through the proposed Shand power station will occur. For Weyburn, it was predicted that effluent removal would reduce peak nutrient concentrations in Rafferty Reservoir but would not change the overall eutrophic status of the reservoir. The proponent indicates that

monitoring will take place to assess the effects of the effluent on the reservoir. There are about 13 other communities that currently discharge sewage into the river or into ponds which could drain into it. We agree with the EIS that the potential water quality impacts of these discharges likely would be small.

5.4 The soils in the study area are well characterized with regard to physical and, to a lesser extent, chemical features. However, their impact on the reservoirs' water quality should be considered to a greater extent.

5.5 Several of the oil wells in the Weyburn Unit will be elevated rather than directionally redrilled and, as a result, will be located very close to the reservoir at full supply level. In view of the uncertainty of the reservoir fill time and the expected fluctuations in water levels, these wells will increase the risk of spills into the reservoir.

5.6 The anticipated water management regime in the potentially affected area is addressed only in very general terms. The impacts of pollutants, siltation, irrigation runoff and

altered temperature and seasonal regimes on the aquatic ecosystems need to be addressed more thoroughly.

6. FISH AND WILDLIFE

6.1 The data presented adequately cover:

a) a wide range of river and tributary habitats with which a variety of fish species are associated;

b) predicted impacts on these habitats and fish from the Rafferty dam development;

c) suggested mitigation measures; and

d) fishery development opportunities.

6.2 Data from the proposed Alameda reservoir and from the Souris River downstream from the proposed Rafferty dam are incomplete. However, the proponent indicates commitment to obtain further information.

6.3 The projects will reduce habitat for deer and for sharp-tailed grouse. Funds have been identified to create new habitat. In addition, the projects likely will create significant new staging areas for waterfowl, providing added tourism and recreation potential.

6.4 The proponent has recognized the major wildlife significance of the project areas and the proposed development. More data are required to document the magnitude of wildlife populations associated with the valleys, and the probable impact of the developments on them. As well, more information is needed on rare and endangered species and on furbearers. It is acknowledged that the proponent is seeking such information from additional studies in the Alameda area and the Souris River valley downstream from Estevan.

6.5 Water management plans for important nearby wetlands should be included in the "plan of operation" for the projects and in any related documents.

6.6 Use of Habitat Evaluation Procedures (HEP) for analyzing wildlife impacts in the proposed Alameda reservoir, and in the Souris River valley downstream from Estevan, should obviate most concerns about assessing the impacts of the developments on these areas. The HEP analysis has been shown to be quick, efficient and reasonably accurate, and it will strengthen the existing impact statement.

6.7 The mitigation proposals put forward are ecologically sound and have considerable fiscal resources dedicated to them. There is no doubt that their implementation will ameliorate the impact of the Rafferty development. However, the lack of detailed knowledge of the habitats and the wildlife populations makes it unclear whether these measures will result in "little net loss" of habitat for these species. The additional data collection which the proponent is prepared to do will enable more detailed assessments of the mitigation's effectiveness.

7. AGRICULTURE AND LAND USE

7.1 The EIS recognizes that the amount of irrigable land near the reservoirs which could be developed economically is relatively small. Furthermore, there is no assurance that sufficient water will be reliably available to irrigate all of the land which could be potentially available for irrigation.

7.2 The report assumes that irrigation will be realized on 2-3 times the number of acres as are currently projected for irrigation within any of the individual areas being developed

under the Canada-Saskatchewan ERDA Irrigation Sub-Agreement. There is a difficulty in promoting the Souris Basin project on the basis of the benefits that irrigation will have on the economy of the region, lacking discussion of the ways in which, and the extent to which, irrigation in the area can reasonably be implemented.

7.3 The proposed projects will result in loss of agricultural land, but may promote increased productivity on some lands following implementation of irrigation. Both economic and productivity benefits and losses will be realized.

8. ARCHAEOLOGY

8.1 It is clear the proposed project areas contain numerous heritage resources, several of which are highly significant to understanding the prehistory and early history of the Souris Basin and southeastern Saskatchewan. The construction of the Rafferty and Alameda dams will disturb and destroy many of the archaeological sites thus far located in the proposed impoundments. However, the losses of heritage resources can be mitigated by an

appropriate impact management program. The Souris Basin Development Authority has proposed such a program.

8.2 The impact management program proposed on pages 49 to 52 is regarded as sufficient to mitigate the majority of predicted impacts. However, the possibility remains that highly significant or sensitive resource types (e.g., prehistoric agricultural settlements, burials) may be encountered which could require special measures above and beyond those proposed in the impact management program. This possibility has been anticipated in the Heritage Resource Impact Management program General Terms of Reference.

8.3 The heritage resources component was clearly identified within the project, and appropriate investigations are and continue to be carried out. The impacts have been spelled out, and the mitigative plans developed appear appropriate and, as far as can be determined, adequate. The consultation between the Souris River Basin Authority and Saskatchewan Parks, Recreation and Culture should provide for ongoing address to issues as they arise in the course of continuing investigations.

8.4 Contingency provisions should be made available for archaeological mitigation. Such contingency operations may be required:

a) during regular mitigation activities if unusually significant materials are discovered which require extensive site excavation;

b) during construction, when buried sites not normally noted during surface surveys may become exposed; and

c) during reservoir operation, when wave action at newly created shorelines may expose significant materials and sites.